

SCIENCE

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THE TRIUMPH COMPOUND STEAM-ENGINE.

THE steam-engine shown in the accompanying illustrations is of a novel and ingenious design. The aim of the builders has been to produce a valveless compound engine, and that they have succeeded admirably in designing and building such a machine is admitted by all whose experience with steam-engines enables them to judge.

through the cylinder casting, it is evident that the omission of the valves has not led to troublesome complications in other directions.

In the illustrations, Fig. 1 is a vertical longitudinal section through the engine, Fig. 2 is a vertical cross-section through the same, Fig. 3 is a horizontal cross-section through the live-steam parts, and Fig. 4 is a horizontal cross-section through the expansion parts.

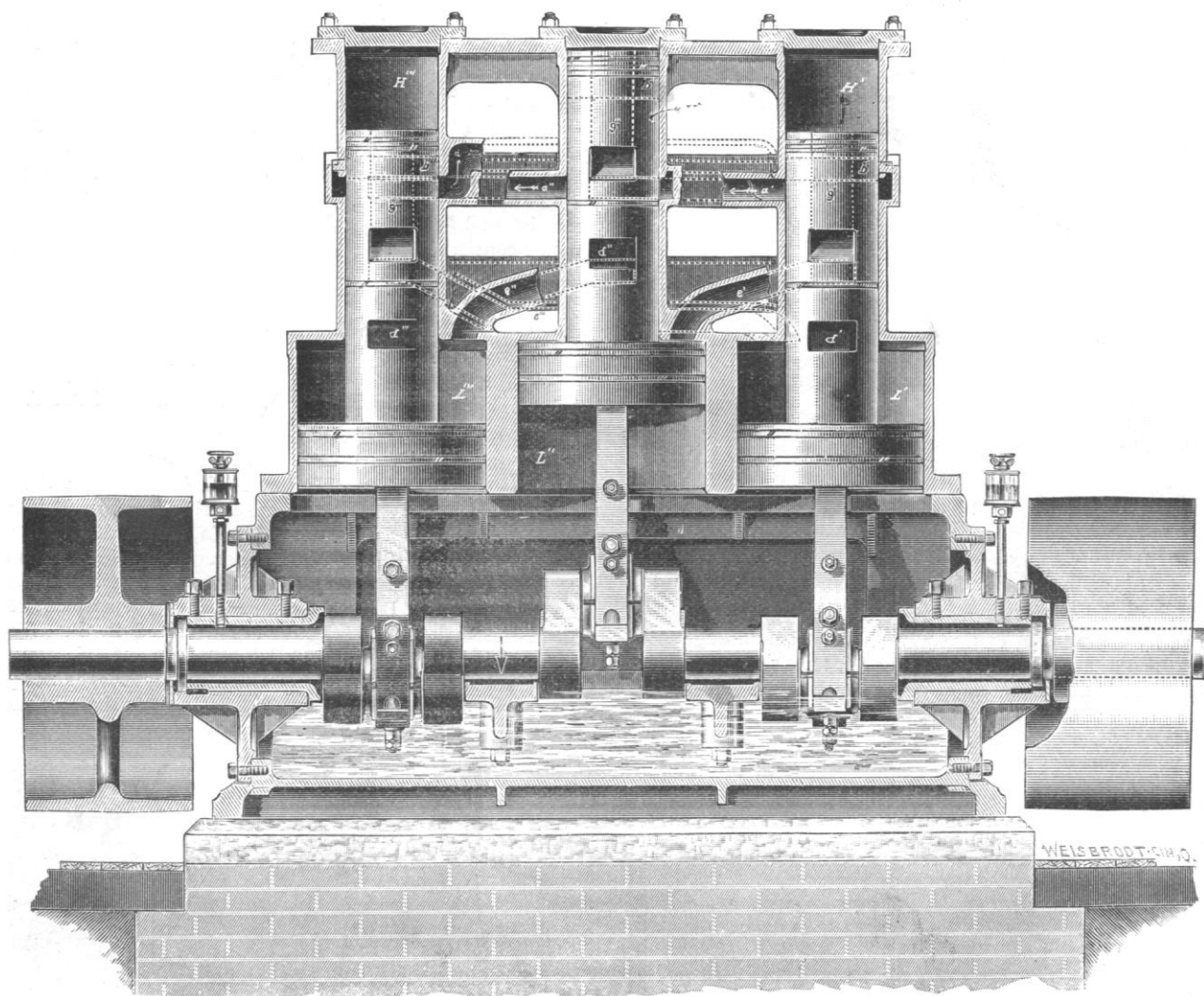


FIG. 1. — TRIUMPH COMPOUND VALVELESS STEAM-ENGINE.

The engine shown, which is built by the Triumph Compound Engine Company of Cincinnati, has three high and three low pressure cylinders, each with single-acting pistons. Each high-pressure piston controls the steam-supply to its own cylinder and that of one of the low-pressure cylinders. The exhaust is also controlled in the same manner; so that the high-pressure pistons do double duty, acting as pistons and as valves. As the latter office is performed by means of passages through the piston-heads and

H' H'' H''' are high-pressure and L' L'' L''' are low-pressure cylinders, and the pistons acting in each will be referred to by the same letters. The pistons are connected directly to the shaft by connecting-rods without the intervention of piston rods; and the cranks are set at an angle of 120 degrees with each other, in which position all the moving parts are perfectly balanced.

Pistons H' and L' are shown on the upper centre, pistons H'' and L'' being 120 degrees in advance, and pistons H''' and L''' 120

degrees in the rear. In this position, live steam is admitted from the main steam-pipe *a* (Fig. 3), thence through ports *b'*, pipe *a'*, and port *g''*, to cylinder *H''*; and at the same instant steam which has

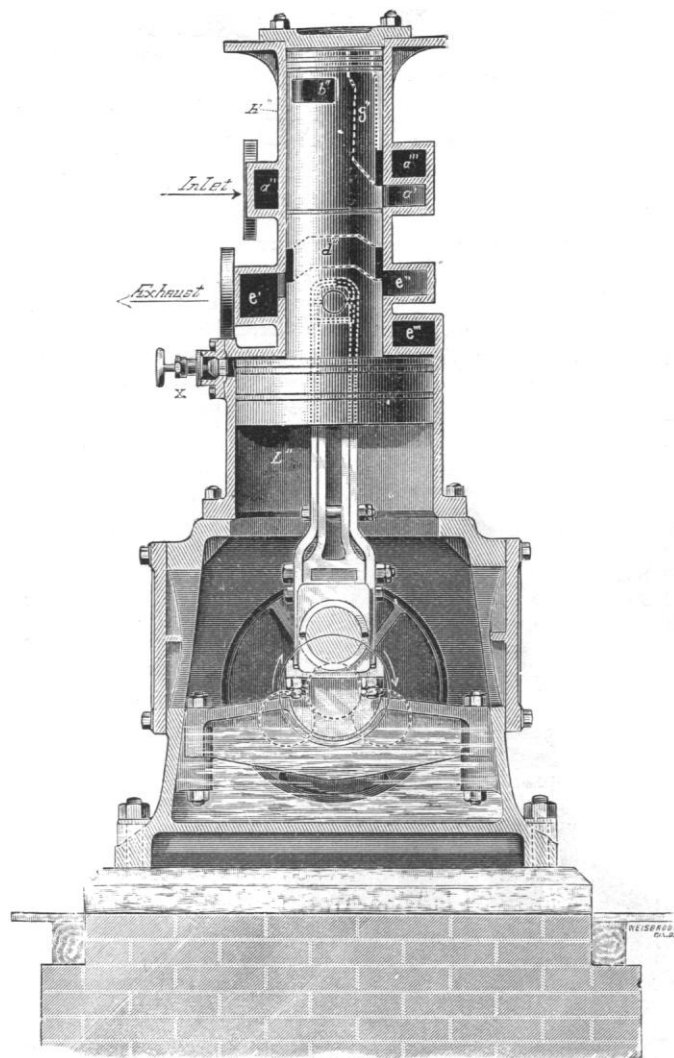


FIG. 2.

been partly expanded in cylinder *H'* passes down through port *g'* (Figs. 1 and 3) and pipe *e'*, to cylinder *L''*, thus admitting live and low-pressure steam on one set of pistons at the same moment. Under the action of the steam, pistons *H''* and *L''* move downward,

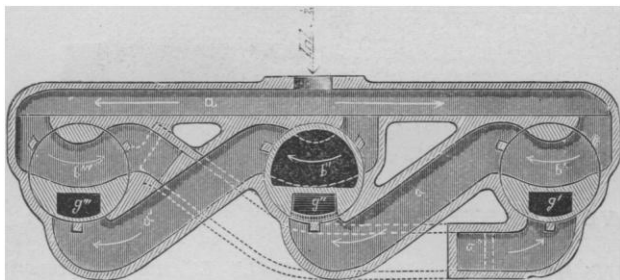


FIG. 3.

live steam being admitted until the upper edge of port *g''* (Fig. 1) passes the lower edge of pipe *a'*, at which point it is cut off, and expands in this cylinder until the lower edge of port *g''* passes the upper edge of pipe *e''*, at which point it passes to cylinder *L'''*. At the same moment live steam passes from *a* through port *b'*

(Fig. 3), pipe *a'*, and port *g'''* (Figs. 1 and 3), to cylinder *H'''*. At this point also, piston *H'*, moving upward, closes the connection between cylinders *H'* and *L''*, and the steam expands in *L''* for the remainder of the stroke. As piston *L''* reaches the lower centre, port *d'* (Fig. 1) comes opposite pipe *e'*, and the exhaust steam passes through this connection into pipe *e* (Fig. 4), which communicates with the atmosphere or condenser. When piston *H'* reaches the upper centre, live steam passes from *a* (Fig. 3) through port *b'''*, pipe *a'''*, and port *g'*, to cylinder *H'*, and the partly expanded steam passes from cylinder *H''* down through port *g'''* (Fig. 1) and pipe *e'''* to cylinder *L'*. Cylinder *L'''* exhausts through pipe *e''* and port *d''* into *e*, and cylinder *L'* through pipe *e'''* and port *d'''* into *e*.

The valve *X* (Fig. 2) is merely a live-steam connection with the low-pressure cylinders for heating up and starting. Thus, with the exception of the cut-off, each set of pistons controls the steam in the cylinder next preceding, in the order of rotation, and, when acting as a valve, is at or near its maximum speed; while the pistons in the preceding cylinders are at or near their slowest speed. This simple expedient controls the steam in this engine in a manner unexcelled by any valve device.

All lubrication is automatic, consisting of a sight-feed lubricator on the steam-pipe, a drop-sight-feed cup on each end-bearing of the shaft, and a mixture of oil and water in the crank-case, perfectly lubricating all parts within. The cylinders are cast in one piece, and bored at the same time on a tool especially designed for the purpose, by which means they are made absolutely parallel, and the danger of leaky joints is avoided. The bearings for the shaft are bored out after being bolted in place, insuring perfect alignment; and all wearing surfaces are exceptionally large, so that internal friction is reduced to a minimum. The only adjustments consist of two keys in the connecting-rods, which take up all the wear in both boxes. The pressure being always downwards, these adjustments are seldom necessary; and the engine, it is claimed, will run indefinitely without stoppage, and with but little attendance.

THE TENSILE STRENGTH OF SHEET ZINC.

So little has been published about the strength of zinc, that any contribution to this question must be welcome. The most careful tests which Professor Martens made on some zinc sheets supplied by the Schlesische Actien-Gesellschaft für Bergbau und Zinkhüttenbetrieb at Lipine, in Silesia, on behalf of these works, hence, deserve all the more attention. These tests, according to *Engineering* of Jan. 31, were carried out at the Royal Technical Testing Station at Berlin, of the mechanical department of which Professor Martens is chief, and are described in the official reports of that institution, 1889, IV.

The reputation of zinc as a structural material is not particularly good, and these tests do not tend to show that the metal de-

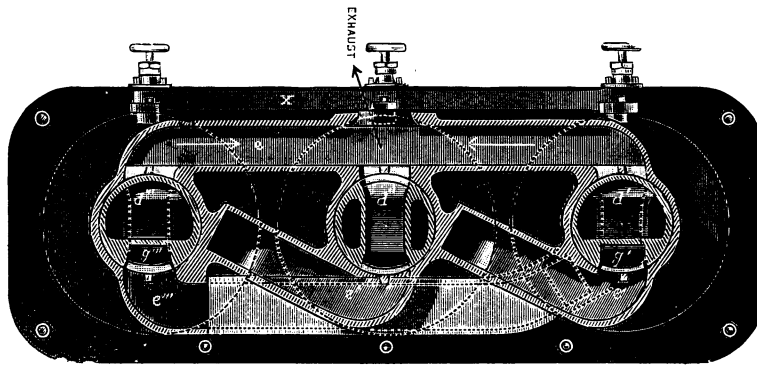


FIG. 4.

serves a better name for constancy and reliability of its mechanical properties. A great many tests had to be made to arrive at fair averages. The test samples were five sheets, supplied by the Silesia mills of the above works, two specimens from foreign works; and finally eleven sheets rolled before Professor Martens

out of bar plates of 1 foot width. Three of these latter were rolled out to two, three, and four times their length, to thicknesses of 6.1, 5.4, and 3.1 millimetres: the other eight were rolled in bundles, first in one direction, then at right angles to

1 per cent of lead and .02 of one per cent of iron; the two foreign plates showed traces of antimony; no other metals were observed.

The first series of tests was made with a horizontal Rudeloff

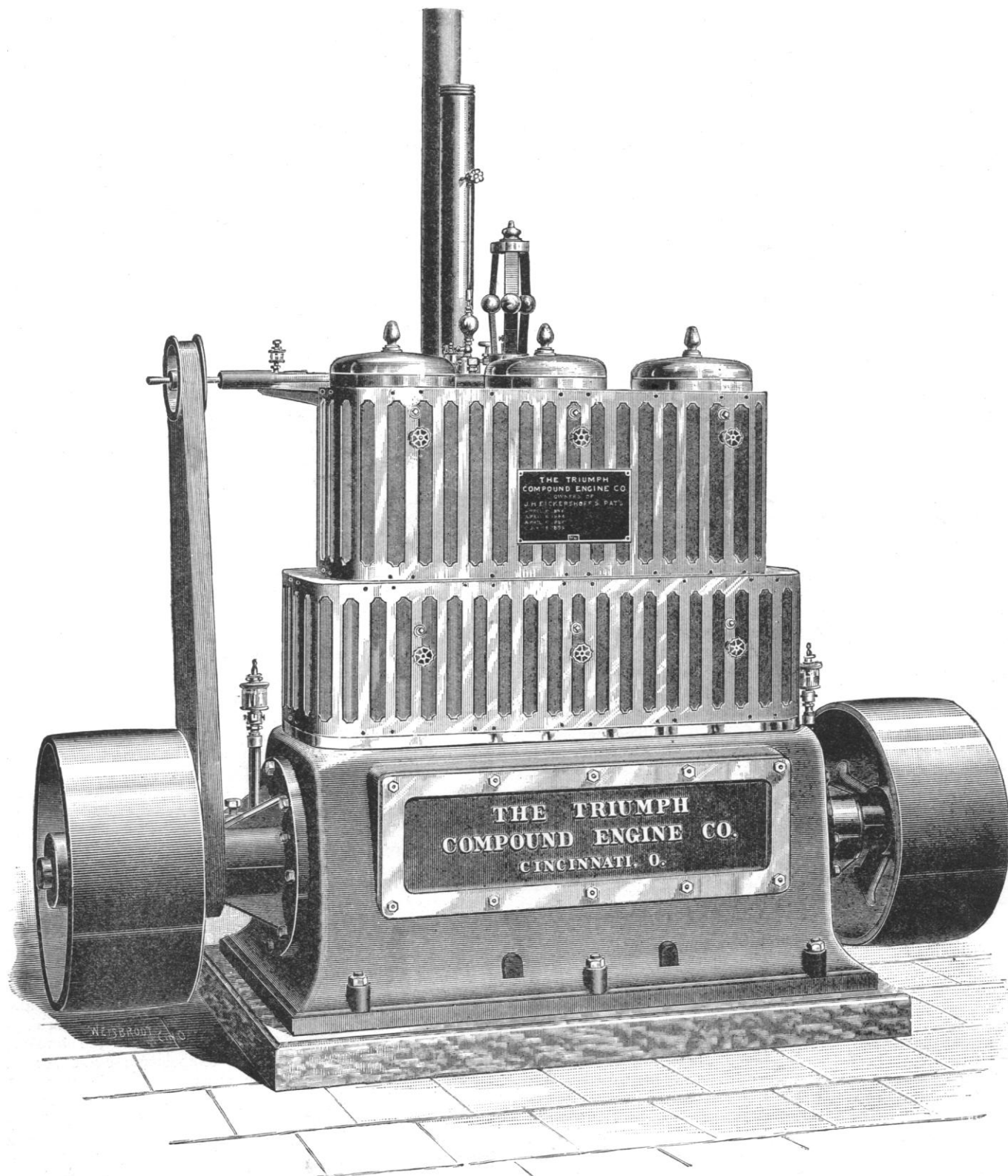


FIG. 5.—TRIUMPH COMPOUND VALVELESS STEAM-ENGINE.

this direction, test-pieces being cut out each time when the length had increased by 500 millimetres. The final plate varied in length from 1,210 to 4,710 millimetres, and in thickness from 1.1 millimetres to .6 of a millimetre. The chemical analyses of the various plates agreed very closely: they all contained about

testing-machine with scale-pan, screw, and nut-feed; the prismatic test-pieces, 20 millimetres (.8 of an inch) in width, being fixed in caps, and tightened there by means of wedges. The pieces frequently broke close to this clamp; and it was found that the length of the wedge, and the distribution of the pressure, were

of considerable importance. The wedges should press out the mouth of the clamp slightly, but more and more towards the back. Direct application of the loads proved quite unsuited, as zinc is highly influenced by the rapidity of the changes. Professor Martens, therefore, resorted to a testing-machine of his own design, three different modifications of which were employed. As indicators for these apparatus, a circular vessel filled with mercury was employed, from the side of which a vertical tube branched off. The cover of this vessel was formed by a strong central plate supporting a weight surrounded by a ring of german-silver. The strain imparted to the test-piece was partly taken up by the weight, the mercury column effecting the balance. This arrangement, which resembles others employed for similar purposes, did not answer; it was, moreover, not self-recording. The mercury-tube was therefore replaced by a horizontal cylinder with a piston-rod ended in another piston moving in a second cylinder with a slide-valve, which was actuated by an electric device comprising electro-magnets and relays. The common piston-rod carried a pointer recording on a paper drum. A third device, also electrical, but worked by gravity instead of water-pressure, was employed for the highest loads up to 50,000 kilograms. These three arrangements labored under the disadvantage that the cover of the mercury vessel retained an amount of mobility sufficient to affect the accuracy of exact measurements. Professor Martens hence returned to an often-employed arrangement, utilizing the elasticity of a spring of an elastic steel rod. The idea is, that the variations of the rod are marked directly (and without being magnified by multiplying levers or other devices whose accuracy Mr. Martens altogether questions) by means of a little conical diamond point on glass plates of the size for microscopic slides, fixed on a platform moved by means of a micrometer-screw and adjusting-spring, in a direction at right angles to that of the axis of the rod. Two of the resulting curves would occupy a space of not more than a square millimetre. The plates were examined and measured in a large Zeiss microscope provided with micrometers for both object and ocular glasses. In this form, the recording device has been constructed by Mr. Boehme. It is, however, intended to leave the platform at rest, and to register the movements in the direction of both the abscissæ and the ordinate.

The chief objects of the tests were to ascertain the elasticities at ordinary temperatures and at 80°, 120°, 150°, 170°, and 200° C. (between 176° and 392° F.), and to ascertain the influences of different modes of rolling and of time-effects. The latter are striking. One can hardly speak of the elasticity of rolled zinc, as even under very small strains the permanent expansion varies with each change of load. There was always a noticeable after-stretching. When cold, the breaking strength was 23 per cent larger, the breaking extension 22 per cent smaller, and the "fulness degree" (i.e., the ratio of the area comprised by the curve to the rectangle formed by the greatest extension multiplied by the greatest force) neither larger nor smaller, in a direction at right angles to the rolling, than in that of the rolling. The two samples supplied by other works showed, however, opposite characteristics, and one test-piece particularly deviated in a manner probably to be accounted for by some peculiar treatment during manufacture, the chemical composition seeming to afford no explanation. Rising temperatures modified the results. The breaking strength increased considerably in thinner sheets; that is, in such as have undergone greater and more continued pressure in the rolls. It rose from 11 kilograms per square millimetre for 6-millimetre plates, to 19 kilograms for plates .48 of a millimetre thick. The English equivalents of these values are 17.5 and 30 tons per square inch respectively for plates of .24 and .019 of an inch in thickness. The breaking extension decreases first, and increases rapidly afterwards. For the temperature tests, the pieces were heated in a linseed-oil bath. The results confirm the well-known and important fact, first established by Silvester and Hobson of Sheffield, that zinc should be worked, rolled, stamped, turned, etc., at 300° F., and that any higher temperature should carefully be avoided. On the whole, the tests demonstrate clearly that ordinarily tensile strength tests are not alone sufficient, and should be combined with folding and bending tests.

METEOROLOGICAL OBSERVATIONS ON PIKE'S PEAK.

SINCE the Boyden fund of the Harvard College Observatory was established for the purpose of obtaining astronomical observations at some station of great elevation above the level of the sea, an inquiry into the meteorological character of such stations seemed desirable before undertaking the proposed work. It was known that a long series of meteorological observations at the highest station ever permanently occupied for such a purpose had been made by the United States Signal Service on the summit of Pike's Peak, in Colorado. It was accordingly proposed to the chief signal officer of the United States Army, Gen. A. W. Greely, that these observations should be printed at the expense of the Boyden fund, in the "Annals of Harvard College Observatory;" and his courteous co-operation has enabled this plan to be carried out, as shown in Vol. XXII. of the "Annals" of the observatory, just published.

The summit of Pike's Peak, Colorado, is situated in latitude 38° 50' north, longitude 105° 2' west, and has a height of 14,134 feet above sea-level, as determined by spirit-level from Colorado Springs. It is the highest meteorological station in the world; Leh, Ladakh, being 11,503 feet, and the Sonnblick, Austria, 10,154 feet. The station on the summit of Pike's Peak was established in October, 1873, and the first telegraphic report sent on Nov. 6 of that year. The telegraph line was frequently interrupted, and for long periods, until November, 1882, when it was virtually abandoned, owing to the great cost and the difficulty of its maintenance. Observations, however, were continued until September, 1888.

During the first few weeks the observations were more or less interrupted, and it has been deemed best to commence the publication from Jan. 1, 1874, at which date the station was in complete working order.

Pike's Peak rises very abruptly from the eastward, being about 8,000 feet above Colorado Springs, which is within ten miles or so from the summit. The open plain extending to the eastward affords unusual advantages for noting such cloud and storm phenomena as originate or move to the eastward of the mountain; and even the peaks to the westward are enough lower to permit observation of storm and cloud conditions below the level of the observer on Pike's Peak.

Perhaps the most notable fact resulting from a cursory examination of the meteorological elements is the remarkable resemblance between the recurring annual phases of atmospheric pressure and the temperature of the air. The curves of these elements not only are alike in having a single bend, but the maximum phase of both occurs in July, and the minimum in January. Not only are these elements coincident in their extreme phases, but the annual march is the same; so that the two curves are not only parallel, but almost coincident. When examined mathematically, it will be seen that not only are the plus and minus changes from month to month the same for both elements, but they bear a close, definite, and apparently dependent relation to each other, the mean monthly pressure rising or falling about .016 of an inch for each change of one degree Fahrenheit in the monthly mean temperature.

A similar relation between the mean monthly pressure and mean temperature obtains on the summit of Mount Washington, New Hampshire (elevation 6,279 feet above the level of the sea); but the barometer and temperature curves for the year at this last-named station are not as regular as on the summit of Pike's Peak. On Mount Washington, while the extremes of monthly mean temperature fall likewise in January and July, yet the maximum monthly pressure shows a tendency to prolong itself into August, and the minimum pressure to continue throughout January, February, and March. The relation on Mount Washington of monthly changes of pressure to like changes of mean temperature differs slightly from that of Pike's Peak, being about .012 of an inch rise or fall for each degree Fahrenheit.

The actual atmospheric pressure at Rocky Mountain stations above 4,000 feet elevation attains its minimum in January and its maximum in July or August; and the barometric phases

are of the same sign, with reference to the annual mean, as the temperature phases at such stations. This phase of barometric pressure, which is the reverse of that in the parts of the United States of low elevation, results from the lower average temperature of the winter months contracting the great body of air, so that much of it is brought below the summit of the mountain, while in summer reverse conditions obtain.

The mean temperature of Pike's Peak is 19.3° , with a range in the annual mean temperature of 4° , dependent on the mean of 17.9° for 1880 and 21.9° for 1879. The highest temperature observed was 64° , July 19, 1879; and the lowest, -39° , Dec. 21, 1887. As might be expected, the range at Mount Washington is considerably greater. The mean temperature at this latter station is 26.1° , with a range in the annual mean temperature of 4.5° , — from 23.5° for 1875, to 28° for 1878. On Mount Washington the highest temperature recorded was 74° , Aug. 9, 1872; and the lowest, -50° , Jan. 22, 1885.

The daily range of temperature on the summit of Pike's Peak, as determined from ten years' observations with self-registering instruments, shows that the maximum range occurs in July and September (14.3° and 14.2° respectively), with the minimum of 11.6° in December. The greatest range likewise occurs at adjacent stations on lower level in the summer or early fall, as shown by ten years' record at Denver, Col., with the greatest ranges (27.9°) in September and (27.2°) in July; and at West Las Animas, Col., — record of five years, — (32.7°) in October. At Denver the minimum range occurs in February (23.5°), and at West Las Animas in May (29.5°).

It thus appears that the mean daily range on the summit of Pike's Peak is only about one-half of that which obtains on the low plateau country to the eastward. The mean daily range at Mount Washington differs materially from that of Pike's Peak, it having its maximum (18°) in January, whence it decreases quite regularly to July (10.6°), and then rises gradually to the winter maximum. The mean range — from ten years' observations — on Mount Washington is 13.8° , being only slightly less than that at Portland, Me. (15.4°), and at Burlington, Vt. (16.5°).

The precipitation of Pike's Peak exhibits peculiarities in its distribution throughout the year, the amount rising from a primary minimum in February to a secondary maximum in April. A very decided secondary minimum occurs in June, followed immediately in July by the primary maximum. The amount of precipitation in the summer (35 per cent) is substantially the same as that in the spring (33 per cent), the remainder being very equally distributed throughout the autumnal and winter months. The June minimum appears very remarkable, but its authenticity seems assured in view of the fact that at Colorado Springs, at the base of the mountain, and at Denver, nearly 80 miles to the northward, similar rainfall conditions obtain. At Denver the May rainfall is 18 per cent; the June rainfall, 9.5 per cent; July, 11; against 15, 12, and 24 per cent respectively at Colorado Springs, and 13, 6, and 15 per cent on Pike's Peak.

The mean wind-velocity throughout the year is graphically represented by a curve with one bend or inflection; the decrease in velocity being, as a rule, very gradual, from 26.6 miles in January, to 12.5 in July and 12.3 in August. The curve of the mean wind-velocity is substantially opposite in its phase to the curve of the mean temperature; that is to say, the highest mean monthly velocity occurs with the lowest mean monthly temperature, and the least mean velocity with the highest mean temperature. It is interesting to note that the same general rule holds true as bearing on the relations between the mean hourly temperature of the day and the mean wind-velocity. The average hourly velocity of the wind for the entire period decreases gradually from a mean of 23.2 miles per hour between 2, 3, and 4 A.M., to 17.5 miles between 11 A.M. and 12 noon. It is also noted that the minimum hourly wind-velocity for every month in the year occurs between 11 A.M. and 12 noon; but the distribution of the hours of maximum mean wind-velocity is somewhat irregular throughout

the different months of the year, varying from between midnight and 1 A.M. to the hours of 4 and 5 A.M. Doubtless, were means of hourly temperatures available, it would appear that the highest temperature occurs quite regularly at noon, while the lowest temperature occurs more irregularly between midnight and sunrise. In July the maximum hourly velocity is 15.5 miles against a minimum of 9; but in January the range of the mean hourly velocities is very materially reduced, the range being from 28 from midnight to 1 A.M., to 25.4 from 11 A.M. to 12 noon.

Unfortunately, the direction of the wind was not automatically recorded, but the prevailing directions are obvious from the observations made thrice each day. It appears from these observations that 31 per cent of the wind comes from the south-west, 20 per cent from the west, 21 from the north-west, 10 from the north, 8 from the north-east, and 5 from the south; while 2 per cent pertains in each case to the east, south-east, and calms. The direction of the wind changes but slightly through the different months of the year; the records showing that the maximum per cent comes from the south-west from March to October inclusive, but during the winter months the direction changes slightly, and the winds from the west prevail from November to February inclusive, with the north-west winds and the south-west winds of slightly less frequency by 1 or 2 per cent.

On Mount Washington, however, from nine years' observations, 54 per cent of the wind comes from the north-west, 12 per cent from the west, and 8 per cent each from the south-west and north.

The observations for two years at Colorado Springs, at the base of the mountain, show, as might be expected, very different wind conditions. From the situation of this station, it might be inferred that the winds would blow from the north or north-west, or from the south and south-east, which is the case; the order of frequency being as follows: north, 27 per cent; south-east, 22 per cent; north-west, 15 per cent; south, 10 per cent. The influence of topographical features upon the wind is also clearly shown by the direction at Denver, where 28 per cent of the wind comes from the south, and 14 per cent from the north.

Severe and prolonged wind-storms are unusual on Pike's Peak, and the days are comparatively infrequent when the mean hourly velocity equals or exceeds fifty miles per hour. The most remarkable wind-storms were those of Sept. 28–29, 1878, when the mean velocity for twenty-four hours was 71 miles, and Dec. 25, 1883, when the mean velocity was 70 miles per hour. The highest extreme velocity recorded at Pike's Peak was comparatively low, being 112 miles, May 11, 1881.

Velocities exceeding these have been frequently noticed at exposed points on the Pacific and Atlantic coasts. Mount Washington not only has higher winds than the summit of Pike's Peak for short periods, but also for days or months. On Feb. 27, 1886, the mean hourly velocity on the summit of Mount Washington was 111 miles for the entire day, and in January, 1878, the extraordinary velocity of 186 miles per hour was recorded. The maximum monthly movement at Pike's Peak was 28,691, in January, 1887; at Mount Washington, 36,515 miles for January, 1885, a mean hourly velocity throughout the month of 49 miles, followed closely by a mean of 48 miles for February, 1883.

The mean annual cloudiness on Pike's Peak is 40 per cent, ranging from 33 per cent in November, to 74 per cent in July. The tendency is to an excess of cloudiness during the late spring and the late summer, with the least amounts from September to January inclusive. On Mount Washington the cloudiness is much greater, averaging 57 per cent for the year. The range at this latter station is also higher, varying from 52 per cent in September, to 61 per cent in March. The distribution throughout the year on Mount Washington appears to be accidental, with possibly a slight tendency to less cloudiness during the months of high temperature.

Pike's Peak is celebrated for its electrical storms. Many

interesting details of these are given in the observer's journals. The storms only occur when the air is moist; the most favorable condition is during the time a light, soft snow is falling. When the hands are held up, sparks emanate from the tips of the fingers. At such times, with considerable wind, the anemometer-cups look like a circle of fire. Each flake of snow, as it alights on a mule's or burro's back, gives a spark like a firebug. The station was once struck by lightning. The electricity came down the anemometer-rod, following along the wire running to the battery. Every place the wire crossed a nail, the head of the nail was fused, and the wire melted at the same point.

In addition to the regular meteorological observations on the summit of Pike's Peak which appear in the "Annals," other special observations have been made.

HEALTH MATTERS.

Contagious Pneumonia.

DR. F. MOSLER, in a paper read before the Greifswald Medical Society, gives details of a series of cases of acute pneumonia in a family where there seemed every reason for believing that contagion was the cause of the spread of the disease. The patients, says the *Lancet* of Jan. 25, 1890, were all attacked during the last fortnight of January, 1889; the first to fall ill being the father, who died on Jan. 22, the fifth day of his illness. On this day his wife was attacked, and she too succumbed on the fifth day of the disease. While she was ill, her son, who constantly visited his parents during their illness, himself was attacked on the 26th. He was thirty years of age, strong and temperate, but succumbed on the twelfth day of the attack. Further, his sister, who had come from Arendsee, near Stralsund, to be with her sick parents, and who staid in their house from Jan. 22 to Jan. 26, was attacked at Arendsee on Jan. 29, and was admitted into the Greifswald Hospital. She alone recovered.

Dr. Mosler points out that the parents' house was dry, the two rooms they inhabited were well ventilated and clean, and that there had been no illnesses in the house within the past five years. He thinks the father must have acquired his pneumonia outside, and that the disease was communicated in turn to the members of his family by contagion through the sputa. In the case of the son, a *post-mortem* examination showed that the form of pneumonia was not the typical one: it was more lobular, was accompanied by a hemorrhagic pleurisy and by swelling of the spleen. Moreover, an examination by Professor Grawitz of some of the fluid withdrawn from the lung of the daughter during the height of the disease resulted in the discovery of bacilli resembling those of rabbit septicæmia, but neither the pneumo-bacillus of Friedländer nor the pneumo-coccus of Fränkel was found. In the case of the son, the blood from the heart yielded a similar micro-organism. Dr. Mosler thinks that such facts, as well as the peculiarities of the morbid anatomy of the latter case, suggest the occurrence of a special form of pulmonary inflammation, owning a cause different from that of the ordinary form. He sees in such cases a reason for believing that many varieties of poison may give rise to pneumonia. But the main lesson from the cases is that of contagiousness, and the need for the careful disposal and disinfection of the sputa, which he believes to have been the infective medium in these cases. He refers to recent contributions of Finkler and Cantani on infectivity of pneumonia, the latter recording some striking instances where the disease was more of the lobular than the lobar type.

MOUTH-BREATHING AND THE TEETH. — Dr. Scanes Spicer read a paper at the last meeting of the Odontological Society of London, upon "Nasal Obstruction and Mouth-Breathing as Factors in the Etiology of Disorders of the Teeth." In the course of his remarks, as we learn from the *Lancet* of Jan. 8, he said he had been struck with the frequency with which carious teeth were associated with obstruction of the pharynx and enlarged tonsils; so much so, that he had made it a routine

practice to examine the teeth in all cases of nasal obstruction, and he believed that there existed a relation between them; and he further is of opinion that there is a generic relation between some cases of vaulted arch, narrow jaws, and irregular teeth, and nasal obstruction. Normally we should breathe through the nose, so as to warm and filter the air respired. All animals, savage races, and young infants do so; but a large number of adults of civilized nations breathe through the mouth, because they have some obstruction of the nasal passages, — erectile tumors, permanent catarrhal affections, polypi, post-nasal adenoid growths, etc. Mouth-breathing, he said, as a predisposing cause of caries of the teeth, came into action in various ways. The teeth were exposed to a current of air of a much lower temperature than that of the body, which would tend to cause inflammation of the periosteum and pulp of a tooth; the cold, dry air produced congestion of the mucous membrane, with a secretion of stringy acid mucus; and the rapid evaporation of water which takes place when the mouth is constantly open inspissated this mucus, which so formed a fertile soil for the development of micro-organisms. Again: when sleeping with the mouth open, the tongue falls back, and the parotid secretion finds its way directly through the pharynx instead of bathing and washing the teeth. With reference to the so-called V-shaped maxilla, Dr. Spicer thought that many cases might be traced to mouth-breathing, the muscles of the cheek pressing unduly upon the soft alveoli when the mouth is open.

SCRATCHING THE BACK FOR INTERMITTENT FEVER. — Dr. Alois Fénykövy communicates to a Vienna medical journal an account of some observations made on the treatment of intermittent fever by means of friction of the back along the spine. Many years ago, as stated in the *Lancet*, while at Nisch with his regiment, there occurred so many cases of intermittent fever that the stock of quinine was becoming exhausted, and, in order that the patients might not be entirely without some sort of treatment, it was ordered that they should be rubbed twice a day along the spine with simple ointment. The day after this order had been given it appeared that the usual attack had not come on. Accordingly since that time Dr. Fénykövy has very frequently employed this treatment, and usually with marked success. Indeed, he says that three-fourths of his cases have done very well without any quinine at all.

NOTES AND NEWS.

THE English Royal Meteorological Society have arranged to hold at 25 Great George Street, Westminster, on March 18 to 21 next, an exhibition of instruments and photographs illustrating the application of photography to meteorology.

— Herr Trautweiler thinks that a railway should go to the top of the Jungfrau, and in the *Schweizerische Bauzeitung* gives a brief account of his scheme. The railway would go from the valley below to the summit, and would be almost entirely under ground. There would be several intermediate stations, from which convenient, well-arranged tunnels would lead to points on the mountain whence the best views are to be had. If stormy weather came on, the passengers could withdraw into the shelter of those tunnels. The railway would be lighted by electricity.

— The Thomson-Houston Electric Company of Boston are building several large electric motors, or electric locomotives, for a street-railway company in that city. Each locomotive will be powerful enough to draw a train of cars.

— The Russian Government, it is stated, has announced its intention to begin operations soon on the great railway across Siberia. Work will begin at Vladivostok and at the present eastern terminus of the Russian railway system at the same time. The total length of the line is to be 4,375 miles.

— The Jull snow-excavator, illustrated and described in these columns some months ago, received several severe tests during the recent snow blockades on Western railroads. On Feb. 3 it opened up a blockade on a road between Pendleton, Ore., and

Walla Walla, Wash., where the snow was from ten to fifteen feet deep, and solidly compacted by rain and thaws. The track was cleared in a few hours.

— In the current number of the *Journal of the Anthropological Institute* there is a valuable paper, by Dr. Arthur Thomson, on the Veddahs of Ceylon. Discussing the affinities of the Veddahs, he says there appears to be little doubt, that, if they be not of the same stock as the so-called aborigines of southern India, they at least present very strong points of resemblance as regards stature, proportions of limbs, cranial capacity, and form of skull. The similarities of hair and color between these races, according to *Nature*, have often been remarked; so that, on the whole, if physical features alone be taken into account, Dr. Thomson thinks the affinities of the Veddahs with the hill tribes of the Nilgherries and the natives of the Coromandel coast and the country near Cape Comorin, are fairly well proved.

— According to the *Perseveranza* of Milan, quoted in the current number of the English *Board of Trade Journal*, important sponge-banks have lately been discovered close to the island of Lampedusa, on the southern coast of Sicily. These deposits of sponges extend for over a surface of from fifteen to eighteen marine leagues, and are situated about an equal distance from the south-eastern extremity of the island. The smallest depth above these banks is twenty ells; the greatest depth is from thirty to thirty-one ells. At the lesser depths rock is met with, on which the sponge grows; at greater depths a sandy soil is found. All varieties of sponge are discovered here, including those which are in the greatest commercial request, and they are easy to obtain. Greek and Italian vessels have already (January) proceeded to Lampedusa to take advantage of this discovery.

— One of the most interesting applications of the electric light yet made is to the passage of the Suez Canal at night-time. This great waterway, which is so important to all European nations, and particularly to England, ran the risk of being choked by the continued development of the traffic through it in the years 1882 to 1885. At the end of this period, however, the Canal Company determined to light the channel at night-time, so that the passage could be made without danger, and hoped in this way to sensibly diminish the traffic on the canal during the day, and to render the state of affairs less annoying to ship-owners, until the enlargements now in progress could be completed. The company accordingly installed a complete system of beacons along the banks of the canal, supplemented by luminous buoys burning Pintsch gas on the water, and in this way the channel was clearly marked out. It was soon seen, however, that this alone would be insufficient to insure safety in night passages, and it was therefore decided, says *Engineering* of Jan. 31, that every vessel moving along the canal at night must itself be supplied with arrangements for working a set of electric lamps on board. Rules were accordingly drawn up, which provide that these lamps shall be four in number, one of which is to be a powerful light at the bow, inside of a projector lamp capable of throwing the beam to a distance of not less than 4,000 feet in front of the vessel. The other lights are placed, one at the stern, and one on each side of the boat. The first vessel to make the passage under these regulations was the Peninsular and Oriental steamship "Carthage," in 1886, the transit lasting eighteen hours; but, with the improvements recently effected, the time has now been reduced to sixteen hours for large vessels. The Mangin projector is that principally employed, both war-vessels and vessels belonging to the great mail companies being fitted with this apparatus. Smaller companies usually employ a portable apparatus, which they find ready for hire on their entering the canal, and which they unship again on reaching Port Said or Suez. These sets of apparatus include the projector, a dynamo, and a motor, and certain firms make a specialty of the business of hiring them out. The great companies generally employ a similar apparatus, but are themselves the owners of the plant. The night traffic on the canal has increased very rapidly since it was started. Thus in 1887 there were, in all, 371 night transits made; but in 1889 this number had increased to 2,454 out of a total of 3,420, or upwards of 71 per cent of the vessels passing

through the canal; and four-fifths of the total tonnage used the electric light to assist them. At the same time the average duration of the passage has been reduced upwards of 40 per cent. Putting these facts into another shape, it appears that the effect of the electric light as applied at Suez has been the same as if the canal had been increased from 22 metres, its present width at the bottom, to 32 metres,—an operation which would cost at least \$20,000,000.

— The National Home-Reading Union, London, Eng., has been formed for the purpose of developing a taste for recreative and instructive reading among all classes of the community, and directing home study to definite ends, so as on the one hand to check the spread of pernicious literature among the young, and on the other to remedy the waste of energy and lack of purpose so often found among those who have time and opportunity for a considerable amount of reading. Its objects are (1) to draw up and publish courses of reading adapted to the tastes and requirements of different classes of readers, especially (a) young people, (b) artisans, (c) general readers; (2) to publish for each class of readers a cheap monthly magazine, giving introductions to the prescribed books, answers to questions, and other helps (the readers will be organized, as far as possible, into local circles under suitable leaders, certificates will be issued to those who have completed regular courses of study, and such further assistance as experience shows to be practicable will be rendered); (3) to organize summer assemblies at convenient centres, when lectures will be delivered by experienced teachers, social gatherings held, and excursions arranged. The first reading season commenced on Oct. 1 last, and the union now numbers 5,500 members. It publishes a monthly journal in three sections, printed at the University Press, Cambridge, Eng.: (a) "The General Reader's Magazine," which contains chapters on literature (English and general), nature (organic and inorganic), history (English and general), and political science; (b) "The Artisan's Section" of the monthly journal; (c) "The Young People's Section" of the monthly journal. These all give directions for the reading and study of the prescribed books, abstracts of these books in most cases, and questions on them to be answered after reading. The union bids fair to be a great elevating and civilizing agency, and its very rapid extension and success have already outstepped the most sanguine expectations of its promoters.

— The subject of spelling-reform is occupying a great deal of attention in France. M. Mich. Bréal wrote a very exhaustive article on it in a recent number of the *Revue des Deux-Mondes*, and M. T. Carré has a reply to it in the January number of the *Revue Pédagogique*. After discussing the merits and demerits of the proposals of the thoroughgoing phonetic school, which he characterizes as too sweeping, he passes on to spelling on an etymological basis, and points out the hopeless contradictions of the present system viewed from the point of etymology: *imbécile* with one, and *imbécillité* with two *l*'s; *chariot* and *charrue*, *charrette*; *philosophie* and *fantôme*, *fantaisie*, etc., parallel examples of which can be found, and have often been pointed out, by the English spelling-reformers. He then enumerates the reforms which he considers moderate and within the bounds of practicability: 1. To bring the spelling of the conjugated forms of the verbs in *eler* and *eter* under one and the same rule, and to cease writing *je chancelle* by the side of *je modèle*. 2. To do away with useless exceptions, as in the seven nouns in *ou* that take *x* instead of *s* in the plural. 3. To suppress useless double vowels and consonants; to write *honneur* as well as *honor*; *abatre*, *acabler*, *apeler*, *aporter*, *atraper*, where only one consonant is pronounced; but to continue to write *appétence*, *acclamer*, *annuité*, *innovation*, *immortalité*, etc., where the double consonant is heard. He gives on this point an experience he had at the inspection of a girls' school. He had expressed his surprise to the head mistress at finding some of the eldest pupils copy out from a dictionary lists of words commencing with *ab* and *ac*. "These pupils," replied the head mistress, "have an examination to pass. They must know how to spell *académie* and *accabler*. *apercevoir* and *apparaître*, *alimenter* and *allaiter*, *agrandir* and *aggraver*, etc. If I trust to their getting up the spelling of such

words from the haphazard way in which they occur in dictation and reading lessons, they will never learn them all, and those they do learn must be pointed out to them specially at a great loss of time during these lessons. I thought this plan of exercises better. I own it to be unintelligent, yea, absurd; but it answers its purpose." The inspector confesses that at this reply he was gravelled. 4. To suppress as much as possible all exceptions, and bring them under general rules. We should soon get accustomed to *châteaux, chevaux, cieus*, in which words the *x* is due to a grammatical error. Why write *ails* in botany, and *aulx* in cookery? Why not write *des livres hébreus* as we write *des habits bleus*? Why not give the birthright to *agenda, exeat, errata, quatuor*, and write them with an *s* in the plural? We write *porte-plume* because a holder holds only one pen, but *portecigares* because it holds more than one cigar. This is hair-splitting. On this principle, are we to write *des villageois en casquette*, or *en casquettes*; *du sirop de groseille*, or *de groseilles*; *des oiseaux qui voltigent de fleur en fleur*, or *de fleurs en fleurs*? 5. In the case of compounds that are of constant use, to suppress the hyphen: to write *portoplume, portemonnaie*, as well as *porte-feuille, portefeuille*. On the five preceding points, as well as on the following, M. Carré is at one with M. Bréal. 6. To simplify the rules of the past participle. At present we write, *la maison que j'ai vu construire*, and *la maison que j'ai vue tomber*; but the syntax is the same in both cases. The real object of *vu* is the infinitive with which it forms one phrase, one idea. In the second case, as in the first, it is not *the house that I have seen*, it is *la maison qui tombait*: what I saw is *the house that fell, the falling house*.

— The bound volumes added to the library, Kansas Historical Society, Topeka, Kan., in the past year, numbered 1,269; unbound volumes and pamphlets, 2,248; volumes of newspapers and periodicals, 1,053; single newspapers and newspaper cuttings containing special historical matter, 5,707; maps, atlases, etc., 53; manuscripts, 219; pictures and other works of art, 367; scrip, currency, and coin, 8; war and other relics, 224; miscellaneous contributions, 99. The library accessions during the past year have somewhat exceeded in number the average of former years. They have been of the same general character. The purchases have been chiefly confined to works more or less directly pertaining to Kansas. The additions to the number of volumes of newspapers and periodicals exceed that of any year except one since the organization of this society. This year's experience has brought additional proof of the great value of this department. There are now 9,034 volumes of this class. Of these, 6,613 volumes are files of Kansas newspapers. These represent every county and considerable town in the State. These files are consulted by the people of all classes,—by teachers, students, and local historians and writers; for information as to the early settlements, the organization of societies, churches, and schools; for the proceedings of political conventions and all public gatherings; for the records of public men; and for official and legal notices. In these days historical writers seek for original information as to the early beginnings and the every-day progress of the social life of the people; and they have come to learn that it is in the columns of the daily and weekly newspaper that this information has been most fully recorded, and that nowhere else is exact data to be found. Teachers and students in our educational institutions are more and more learning that the study of the history and development of their own State and locality are worthy of their attention. No little of the correspondence of the secretary is employed in giving information sought by students, teachers, and other inquirers for such local information.

— In one of the lectures delivered at Aberdeen in January, under the Gifford bequest, Dr. E. B. Tylor, says *Nature*, offered a most interesting suggestion as to the meaning of a well-known but puzzling Assyrian sculptured group. This group consists of two four-winged figures, with bodies of men and heads of eagles, standing opposite a tree-like formation, which is easily recognized as a collection of date-palms, or a conventionalized representation of a palm-grove. Each of the two figures carries in

the left hand a bucket or basket; in the right, a body which each seems to be presenting to the palm-tree. What is this body? It is usually described as a fir-cone; but some have regarded it as a bunch of grapes, others as a pine-apple. Dr. Tylor suggests that it should be connected with the most obvious point of interest for which the date-palm has been famous among naturalists since antiquity; namely, its need of artificial fertilization in order to produce a crop of edible dates. This process in its simplest form consists in shaking the pollen from the inflorescence of the male date-palm over the inflorescence of the female. The practice is mentioned by Theophrastus and Pliny, and in modern times in such works as Shaw's "Travels in Barbary." Dr. Tylor exhibited a drawing of the male palm inflorescence, and said it was hardly necessary to point out the resemblance to the object in the hand of the winged figure of the Assyrian sculpture. As the cultivator of the palm-tree has to ascend the tree in order to perform the process of fertilization, he of course takes with him a supply of fresh flowers in a basket. Dr. Tylor's theory, therefore, is that the objects carried by the winged genii of the Assyrians are the male inflorescence of the date-palm in one hand, the basket with a fresh supply of inflorescence in the other, and that the function the genii are depicted in the sculptures as discharging is that of fertilizing the palm-groves of the country,—a function which must have been held to denote their great beneficence, since it showed them fulfilling the great duty of providing the Assyrians with bread.

— The following, published in *Nature* of Jan. 30, is translated from a notice published by the authorities of the Madrid Observatory: "D. Ernesto Caballero, professor of physics, and director of the electric-lighting manufactory in Pontevedra, writes to this observatory, giving details of a remarkable meteorological phenomenon which appeared at 9.15 p.m. on Jan. 2. In a sky serene and clear, there appeared suddenly a globe or ball of fire of the apparent size of an orange, which, after falling (it is not possible to well indicate how or from whence) upon the conducting wires stretched across the city, entered the manufactory (referred to) by a skylight or window, struck the apparatus for distributing the light, from which (after raising the armature of a magnetic current closer) it struck the dynamo at work. In the presence of the alarmed engineer and workmen present, it rebounded twice from the dynamo to the conductor, and from the conductor to the dynamo, then fell, and burst with a sharp and clear detonation into a multitude of fragments, without producing any harm or leaving any trace of its mysterious existence. In various parts of the city the lights swiftly oscillated and were extinguished for some seconds; and that the darkness was not general and long-continued, was owing to the admirable self-possession of the employees, who almost instantly established the order of things, so suddenly and strangely interrupted by this mysterious meteor, of whose action and presence there only remained traces on the melted (or soldered) edges of the thick copper plates belonging to the armature of the circuit-closer. Outside the building, and at the moment of falling upon the conducting wires, it was seen by (among others) the professor of natural history, Señor Garcéran; and, from various effects observed on the wires during the following day, there were undoubted manifestations (in no other way explicable) of its electrical origin."

— An interesting paper is contributed by Professor Carnelley to the *Philosophical Magazine* for January, in which he attempts to express the periodic law of the chemical elements by means of an algebraic formula. For reasons which are given in detail in the memoir, an expression of the form $A = c(m + \frac{1}{v})$ is adopted, where A represents the atomic weight of the element, c a constant, m a member of a series in arithmetical progression, depending upon the horizontal series in the periodic table to which the element belongs, and v the maximum valency or the number of the vertical group of which the element is a member. From a number of approximations, as we learn from *Nature* of Jan. 30, Professor Carnelley finds that m is best represented by the value 0 in the lithium-beryllium-boron, etc., horizontal row; by $2\frac{1}{2}$ in the sodium series; 5 in the potassium series; and $8\frac{1}{2}$,

12, 15½, 19, 22½, etc., in the subsequent rows. Thus m is a member of an arithmetical series of which the common difference is 2½ for the first three members, and 3½ for all the rest. On calculating the values of the constant c from the equation $c =$

$\frac{A}{m + \sqrt{v}}$ for 55 of the elements, the numbers are all found to lie between 6.0 and 7.2, with a mean value of 6.6. In by far the majority of cases the value is much closer to the mean 6.6 than is represented by the two extreme limits: thus in 35 cases the values lie between 6.45 and 6.75. If the number 6.6, therefore, is adopted as the value of c , and the atomic weights of the elements are then calculated from the formula $A = 6.6 (m + \sqrt{v})$, the calculated atomic weights thus obtained approximate much more closely to the experimental atomic weights than do the numbers derived from an application of the atomic heat approximation of Dulong and Petit. The number 6.6 at once strikes one as being remarkably near to the celebrated 6.4 of Dulong and Petit, and Professor Carnelley draws the conclusion that there must be a connection between the two. This assumption appears to be supported by the following interesting facts. If we assume c to represent the atomic heat, then atomic weight = atomic heat $\times (m + \sqrt{v})$ = atomic weight $\times$ specific heat $\times (m + \sqrt{v})$; or specific heat = $\frac{1}{m + \sqrt{v}}$. On calculating the specific

heats of the elements from this equation, they are found to agree remarkably well with the experimental values, except in those cases in which the observed specific heat is known to be abnormal. Again, Bettone has shown that the hardness of the elements is inversely proportional to their specific volumes. If this be so, hardness = $\frac{\text{specific gravity}}{6.6 (m + \sqrt{v})}$; and, on calculating the hard-

ness from this formula, the numbers are again found to agree very closely with the hardness experimentally determined by Bettone. That the periodic law may therefore be approximately expressed by a formula of the type $A = c (m + \sqrt{v})$ appears very probable, and that the number 6.6 is a very close approximation to the value of c appears also to be established. Moreover, the fact that m in the even series represents a whole number, while in the odd series it represents a whole number and a half, corresponds to the well-known difference in chemical properties between the members of these series; and the assumption that the common difference between the first three values of m is only 2½, while between all the rest it is 3½, is borne out by Mendeleeff's statement that the elements of the lithium and sodium rows are more or less exceptional in their nature, and not strictly comparable with the subsequent series.

—The demand for fibre-machinery, so extensive of late years in Mexico, is likely to be increased under more favorable fiscal circumstances by the development on a large scale of the sisal hemp industry of the Bahamas. Last year Sir Ambrose Shea, governor of these islands, which are a natural continuation of Florida, wrote to the *London Times* a powerful appeal that British capitalists should undertake the cultivation in the Bahamas of this rival to manila hemp. The demand for the latter long ago outstripped the supply; and, to make good the deficiency, fibre has been sought for in all parts of the world. The most successful substitute of all, we learn from *Engineering* of Jan. 31, has been sisal, a wild hemp-plant indigenous to Central America and the West Indies. Thanks to the prompt enterprise of Americans, the trade soon began to flourish in Yucatan, where large tracts of waste lands are covered with sisal hemp. Experience, however, soon revealed that only carefully selected plants, properly cultivated, could produce fibre that would stand the tests applied to good manila. It was found, moreover, that the plant was stronger and more fibrous in the Bahamas than in Mexico; and the result was, that in order to render these islands the counterpart of the Manilas in prosperity, if possible, the authorities decided to grant an export bounty of £4 13s. 4d. per ton on all sisal hemp grown in the Bahamas. The effect of this encouragement has been to draw English capital to the islands, where arrangements are now being made to plant ten thousand acres with this useful plant.

Sisal is like an aloe in appearance, and has leaves about six feet long. It grows wild on the poorest soils, sprouting freely from a sucker, and in three years the leaves are ready for plucking. For nearly twenty years it continues to furnish, season after season, crops of these leaves, which are gathered by coolies, placed in fibre-machines, and are baled ready for export within a few hours of being plucked. Excessive drought or rain having no effect on the plant, and no attention beyond pruning being needed after the first year or two, the crop is inexpensive to manage, and practically permanent for twenty years, when the old plants are replaced by young ones. If the energetic encouragement of the governor, and the liberal bounty granted, cause the cultivation of the plant to be conducted on a large scale, a fresh lease of prosperity will be conferred upon the Bahamas, and the machinery trade, as well as the fibre one, will benefit by the new West Indian industry.

—From a desire to verify his own researches as to the causes of failing nutrition in aged organisms, Mr. C. A. Stevens offers three cash prizes of \$175, \$125, and \$100 for the best three comparative demonstrations, by means of microscopical slides, of the blood capillaries in young and in aged tissues, canine or human. By young tissues (canine) are meant tissues from animals between the ages of one and three years. By aged tissues (canine) are meant tissues from animals not less than twelve years of age. By young tissues (human) are meant tissues from subjects between the ages of ten and twenty years. By aged tissues (human) are meant tissues from subjects not less than sixty-five years of age. While a preference will be given to demonstrations from human tissues, it will be possible for work in canine tissues to take the first, and indeed all, of the prizes. But of two slides equally well done in all respects, one canine, the other human, the latter will be given the preference. Canine tissues should be from large animals. Twelve slides from young and twelve from aged tissues must be submitted by each competitor, together with a full description of the subjects, methods pursued, and every detail and circumstance which is likely to throw light upon, or account for, any peculiarity. The slides are for comparison as to the condition of capillary circulation, the young with the old, and should be in numbered pairs, or groups from the same kind of tissue. The term "tissue" is used in a general sense; e.g., pulmonary tissue, hepatic tissue, renal tissue, osseous tissue, muscular tissue, nerve tissue, alimentary tissue, etc. No particular schedule of methods for injection or staining will be insisted upon, and no more definite directions or explanations will be given. The slides, carefully packed and boxed, together with descriptive manuscript, can be sent by mail. It is stipulated that the demonstrations which receive the prizes shall become the property of Mr. Stevens, for publication. All others will be returned, if desired. No pseudonyms required. Accompany slides, in every case, with (real) name and address. Unless of known reputation as a biologist, a reference is respectfully solicited. Reservation: no award will be made unless work of at least ordinary merit is submitted. This offer is made on the first day of January, 1890, and will remain open until the twentieth day of August, 1890. Slides and manuscript will be examined and receipted for as soon as received. The prizes will be adjudged on the first day of October, 1890. These nominal prizes are offered less in expectation of results from the money as an agent than in the hope that the offer may furnish a *point d'appui* for really needed work. Besides professional observers and students, there are in the United States a large number of amateur microscopists of acute vision and undoubted talent, who are at present playing with microscopes as with toys, merely to see the curious or pretty things. The time has come to concentrate observation upon the one proper object of biology; viz., the renovation and prolongation of human life. Mr. Stevens's address is Norway Lake, Me.

—Herbert Ward, the African explorer, in collaboration with D. D. Bidwell, begins in the *New York Ledger* of March 1 a series of articles descriptive of a canoe journey of twenty-five hundred miles on the Upper Kongo.

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BOOK-REVIEWS.

Proceedings of the Society for Psychical Research. Part XV. London, Soc. Psych. Research. 8°.

THIS number of the "Proceedings," though dated December, 1889, has just come to hand. Its contents are very varied, and the titles of the contributions illusively attractive. We may select as the most interesting pages of the number the brief preliminary report on the census of hallucinations, and Mr. Barkworth's paper on "Duplex Personality." The census of hallucinations relates to the answers received to the following query: "Have you ever, when believing yourself to be completely awake, had a vivid impression of seeing or being touched by a living being or inanimate object, or of hearing a voice, which impression, so far as you could discover, was not due to an external physical cause?" In England 2,928 answers have been received (1,633 women and 1,293 men); and of these, 363, or 12.4 per cent, have answered "yes." Of the 363, more

than two-thirds (251) are women. The nature of the impression was visual in 205 cases, auditory in 115 cases, and tactile in 24 cases. Further subdivisions are made, and several interesting points suggested, which will doubtless be fully considered in the complete report. For this, 50,000 answers are desired, and the inquiry is going on in France, Germany, and the United States. In France, up to last October, 633 answers were received (366 from men and 161 from women), of which 106 answer "yes," the percentage of affirmative answers being again much larger among women than among men (31 per cent and 16 per cent). Professor Sidgwick explains the purposes of the census from a point of view certainly not that of those answering the queries, and places as the very last of his remarks a caution, that should have been printed in red ink and large capital letters on all pages of the blanks; namely, to record separately all those who give, or are asked to give, a reply because something is known or suspected of their having had an hallucination. Without this precaution most strenuously observed, the result can have little value in fixing the prevalence of hallucinations. Mr. Barkworth's essay deals very ably and interestingly with those subconscious automatic phenomena whose vital importance in the intellectual life has been so clearly shown, and not least by the phenomena of hypnotism. The tracing of the relation of these degrees of consciousness to various strata of personality, and to those bizarre disintegrations of self presented by morbid psychology, forms the main purpose of the essay.

To deal first with the supplement, we find an account of the recent congress of experimental psychology, and especially of the proceedings of the section on hypnotism, by Dr. A. T. Myers, and several reviews of recent hypnotic literature by Mr. F. W. H. Myers and Mr. Leaf, those by the former being rather controversial in character. To deal fairly and yet critically with the main papers of the number is no easy task. It is all too evident, that instead of profiting by our increased knowledge of the possibilities of deception, and the many side-lights of psychic phenomena which this society, either directly or through its antagonists, has aided and encouraged, the experiments seem to be conducted with fewer and fewer precautions, and speculations indulged in more and more freely. This is not the place or the occasion for the detailed review of the experiments on thought-transference offered by Professor and Mrs. Sidgwick and Mr. Smith, and those of M. Richet on clairvoyance, necessary to show how much weaker the evidence collected will be when clearly and logically stated. The possibilities of those who guess the numbers drawn from a lotto-bag getting a glimpse of what was going on does certainly not seem to have been excluded by the experiments (as related); and nothing can be more suggestive than the small number of correct answers when Mr. Smith is in the next room, compared with the successes when in the same room. Professor Richet's jubilant tone is not consistent with the facts he has to tell. To sit up all night with a nervous subject holding an envelope containing a playing-card in her hand, and taking an hour or more to guess the card enclosed, is certainly a marvellous devotion to science. But a little more method and caution, and enclosing the cards between sheets of metal instead of in envelopes, would probably be more to the purpose than this devotion. We are told nothing of the history of the cards from the time they were bought until placed in the envelope; and so significant a fact as that court-cards were guessed rightly so large a proportion of times is recorded as a peculiarity of the clairvoyance; and over M. Richet's calculation of the chances in the matter one loses all patience. There are also a collection of notes of *séances* with D. D. Home, by Mr. Crookes, for which there seems no sufficient *raison d'être*, and the longest article of the number, by Mr. Myers, on apparitions occurring more than a year after death. It is difficult to take Mr. Myers seriously in this contribution. One always admires the patience in analyzing and describing these many cases of apparitions, but ends by suspecting that Mr. Myers's detailed knowledge of the mental habits of ghosts must be telepathically obtained.

Absolute Measurements in Electricity and Magnetism. By ANDREW GRAY. 2d ed. London and New York, Macmillan. 16°. \$1.25.

THE first edition of this work was published in 1884. It consisted mainly of papers which had previously been contributed to the columns of *Nature* by Professor Gray, together with such alterations and additions as he deemed advisable to make in order to render the book more generally useful. While it made no pretensions to being a complete or exhaustive treatise on the subject, it gave, as far as its limits admitted, a clear account of the present system of absolute units of electrical and magnetic measurements, as well as of some methods and instruments by which the system may be applied in theory and in practice.

Something over a year ago the first volume of a more comprehensive treatise on the subject, by the same author and publishers, made its appearance, which, together with the second volume now in preparation, it was intended would supersede the original small work, then out of print. But Professor Gray found that a demand still existed for the original work, or for one similar to it; and the present edition, amplified and brought down to date, is the result. In it are incorporated a few parts of the larger work, which add much to its value.

Among the many additions to the present work may be mentioned a fuller account of the determination of the horizontal component of the earth's magnetic field; a description of Sir William Thomson's standard electrical instruments; a more complete treatment of the graduation of instruments; an extension of the theory of alternating machines, including Dr. Hopkinson's theory of the working of alternators in series and in parallel, and additional information regarding the measurements of activity, etc., in the circuits of alternators; and a chapter on the theory of dimensions of physical quantities. In the last-named chapter the author takes the view that the dimensions of the electric and magnetic inductive capacities should be left undetermined, and regarded as so related as to render the dimensions of every physical quantity the same in the electro-static as in the electro-magnetic system of units.

A Handbook of Florida. Part I. Atlantic Coast. By C. L. NORTON. New York, Longmans. 16°. 50 cents.

WE are so accustomed in this country to the most trashy kind of guide-books, that it is positively refreshing to find in this first part of what is to be a guide-book of the whole of Florida a book containing the very information a traveller needs, told in plain, straightforward English. Why the majority of American guide-books are so worthless is not so plain, unless it is that there is, or has been, but little demand for any, not to say the best. But it is certain that the plan of setting the ordinary reportorial talent at work in "writing up" our places of interest does not result in any very intelligible descriptions. Mr. Norton's book is a model, and can be commended to those interested, and to those likely to inflict guide-books of another stripe upon the travelling community.

The whole work is not published as yet, but the other parts are promised to be ready soon.

AMONG THE PUBLISHERS.

AT this time, when the works of Jean François Millet are being much discussed, readers will be interested in the announcement of two articles upon Millet, his companions and friends. The May *Scribner* will contain the first of these articles upon the artist's life at Barbizon. The author, Mr. T. H. Bartlett, who has been long a resident of Barbizon and an admirer and student of Millet's work, has incorporated many unpublished letters of Millet, and has furnished a great wealth of new material for illustrating the articles abundantly.

—The following extract is taken from a letter written from Cairo, Egypt, recently received from Mr. Henry M. Stanley, about his forthcoming book: "I believe the work will be in two volumes, from 450 to 500 pages each. God knows there is matter enough, but I would wish to deal very lightly with the

whole from Zanzibar to Yambuya, that the book might be of as high interest as the main theme. . . . I have six note-books filled with matter extremely interesting. Three long chapters are already written. I have a number of most interesting photographs of scenery, sketches of incidents, scenery, etc., and maps will be a prominent feature. I hope it will be ready in May."

—The ninth part of the current series of Edwards's "Butterflies of North America" (Boston, Houghton, Mifflin, & Co.) is fully up to the average standard. The first plate is given up to species of *Argynnis*, the females of two Western species being for the first time figured; while the early stages of our common Eastern *A. aphrodite* are admirably illustrated, every stage of the caterpillar having a colored figure. Only the earliest stage is given by Scudder. Edwards makes the interesting statement that protection is sought at pupation by constructing a tent,—a feature not before observed in this genus. The second plate illustrates the Southern *Satyrus pegala*, but only the butterfly; and the third, *Erebia Epipsodea* of the Rocky Mountains. Heretofore our knowledge of the transformations of any species of this genus, abundant in parts of Europe, has been most meagre, but here we are treated to a plate full of exquisite details, leaving nothing to be desired; and this when the insect had to be obtained from points thousands of miles away, and sent five hundred miles again to the artist. We are equally amazed at the enterprise and the success of the author. The chrysalis was found to pupate in an inclined position, head upward, in a clump of grass whose blades were fastened by a few threads, forming a rude kind of cocoon. The spines of the cremaster are without hooks. Illustrations of the transformations of other satyrids are promised in the present volume; and Mr. Edwards hopes to show that this group should be placed at the bottom, and not at the top, of the butterflies,—not an easy task when he has to ignore the fundamental structure of the final stage. This excellent iconography, which has appeared at intervals ever since 1868, surpasses in the excellence of its illustrations any heretofore attempted or now publishing; and it is strange indeed that the entomologists of Europe have not been spurred by its excellence to some sort of rivalry in illustrating the histories of their native species. They have nothing which can in any way approach it, and yet the cost of work of this class is far cheaper in Europe than with us. Mr. Edwards's enterprise should be well sustained.

—According to a circular lately issued by the Geological Survey of Arkansas, we learn that an act of the Legislature directs that the reports of the State Geological Survey, with the exception of certain specified copies, shall be sold by the secretary of state at the cost of printing and binding. The reports thus far issued, and their prices, are as follows: "Annual Report for 1888, Vol. I., Geology of Western Central Arkansas," by mail, one dollar; "Vol. II. South-west Arkansas," one dollar; "Vol. III. Coal," seventy-five cents. They may be had by addressing Hon. B. B. Chism, secretary of state, Little Rock, Ark. Reports are being prepared, and will be issued as soon as possible, on the following topics: 1. Kaolins, clays, and clay shales; 2. Complete report on the coal of the State; 3. Manganese; 4. Marbles and limestones; 5. Novaculites; 6. Crystalline rocks; 7. Washington County; 8. Crowley's Ridge; 9. Miscellaneous reports.

—Mention has been made from time to time of the topographical map of Massachusetts, the plan of joint work by the State and the United States Geological Survey, the Greylock map issued by the Appalachian Mountain Club, and the general map of the State of recent date, all having been described in our columns. There is now to be added a "map of the country about Boston," again issued by the Appalachian Club, a very welcome addition to our local cartographic material. It is printed from the stones that will be used in the final issue of the map for the State, the scale being 1:62,500, with brown contours every twenty feet. We are glad to note that it comes from the lithographic establishment of George S. Harris & Sons of Philadelphia; and from this it may be inferred that the number of houses capable of doing this sort of work in our country is increasing, and that the

deserved monopoly that prevailed some years ago in map-engraving can no longer be so described. The map is a handsome piece of work, and will serve as an excellent basis for scientific work about Boston and Cambridge. It can be obtained of W. B. Clark & Co., Washington Street, Boston, sales-agents for the Appalachian publications.

— James J. Chapman, Washington, will publish March 25 the second volume of Gen. V. Derrécaix's work on "Modern War," translated by Lieut. C. W. Foster, U.S.A. This volume will treat of the grand tactics, illustrating tactics of the march, manoeuvre marches, combats, battles (important modern combats and battles given in illustration), pursuits, and retreats.

— Little, Brown, & Co. have in preparation "Myths and Folk-Lore," by Jeremiah Curtin; the fifth and final volume of Palfrey's "History of New England," from the author's manuscript by his son, with full index to the complete work; "The Way Out of Agnosticism, or, The Philosophy of Free Religion," by Frances Ellingwood Abbot, author of "Scientific Theism;" and "The Influence of Sea Power in History," by Capt. A. T. Mahan, U.S.N., an important historical work, showing the great power and influence developed by naval forces.

— Professor John Henry Comstock begins in the *New York Ledger* of March 1 a series of six articles on the study of insects, in which he describes not only those insects which are useful to the farmer, but also those which destroy entire fields of grain, cotton, and rice, and ravage orchards, gardens, and vineyards. He demonstrates how it was scientifically determined that an average annual loss of \$30,000,000 has been occasioned in the South by the cotton-worm alone; and that an average loss per year of nearly \$2,400,000 has been brought about in the apple-crop of Illinois by the ravages of the codling-moth. The series is illustrated.

— "American Whist Illustrated," by "G. W. P.," has just been published by Houghton, Mifflin, & Co. It is needless to say that this is a book for whist-lovers. The dedication to "The players of whist who study the game" seems to hint that no scoffers need expect even a nod of recognition if they were to be so bold as to intrude themselves upon the sacred band of whist lovers who will doubtless peruse the pages of "American Whist Illustrated." That many will read is sure from the fact that many have carried away and read the dozen and more editions of "American Whist" and "Whist Universal," from a union of which the present volume is the result.

— Lippincott's series of school readers are likely to attract attention. "The Third Reading-Book," by Eben H. Davis, has just been issued. The book introduces its users to the writings of the most popular authors of juvenile literature, many of the leading publishers having granted the use of copyright matter. The well-drawn pictures for language exercises are a novel feature.

— E. & F. N. Spon have issued an "Engineers' Diary and Reference Book, for Engineers, Machinists, Contractors, and Users of Steam." It is a neatly bound volume of 150 quarto pages, alternate leaves being left blank and ruled for writing. Among its contents are many reference-tables of weights, measures, money, and wages; coal and iron trade statistics; recent legal decisions interesting to engineers; an index of recent technical literature; recent papers presented to Parliament relating to canals and railways, mining, explosives and fires, shipping, sanitation, etc.; reports of the Board of Trade and mercantile marine; and a list of engineering and allied societies. Though the book is prepared with special reference to the needs of engineers in Great Britain, it contains much that will interest those on this side of the water.

— In *Babyhood* for February is described a recently discovered means of relieving whooping-cough, which is purely mechanical, and seems worthy of trial by mothers and intelligent attendants. Another medical article which will interest parents is that on "A Diet Disease," by Dr. James H. Young, in which the results of the injudicious feeding of infants are brought out. Color-blindness, and the means of detecting and treating the defect, form the subject of an article by Dr. C. H. May.

— Messrs. E. & F. N. Spon announce a second edition, revised, of "Naturalistic Photography," for students of the art, by P. H. Emerson; "Mechanical Graphics," a second course in mechanical drawing, with preface by Professor Perry, arranged for use in technical, and science and art schools, and colleges, by George Halliday; and a second edition of "Aid Book to Engineering Enterprise," by Ewing Matheson.

— The following are the contents of No. 6 of the fourth volume of "Studies from the Biological Laboratory," issued by the Johns Hopkins University, Baltimore: "On the Morphology of the Compound Eyes of Arthropods," by S. Watake; "On the Anatomy and Histology of *Cymbuliopsis Calceola*," by J. I. Peck; "On the Amphibian Blastopore," by T. H. Morgan; and "On a New Actinia, *Hoplophoria Coralligena*," by Henry V. Wilson.

— Messrs. D. Appleton & Co. have just issued a book entitled "Exercises in Wood-Working, with a Short Treatise on Wood," by Ivin Sickels. These exercises were prepared originally for students of the College of the City of New York, as long ago as 1883. From time to time they were modified as the author gained in experience, and now they are published, that those who are interested in manual training may have the benefit of this course that for five years has proved itself satisfactory. But it is not to be supposed that this is solely a treatise on the handling of wood-working tools: the structure of wood is described, and a very large amount of space is given to the methods of seasoning wood, to the age of trees and their decay, to the measure and value of wood, and to the diseases and insect enemies of wood.

— Three volumes in the Romance of Science Series have recently been published by the Society for promoting Christian Knowledge, whose agents in New York are Messrs. E. & J. B. Young & Co. The smallest of these is "The Story of a Tinder-Box," by Charles Meymott Tidy. Mr. Tidy originally told this story in a course of three lectures to young people at the London Institution during the Christmas holidays of 1888-89. They are profusely illustrated by experiments that are sure to be suggestive to teachers in this country. "Time and Tide" is the title given by Sir Robert S. Ball to his number of the series, which contains the substance of two lectures before the London Institution. That this is a subject extremely difficult to handle without mathematics, goes without saying; but it can be said that the illustrious author acquits himself with due honor. The people of not so many years ago believed that our moon was a new creation each month; but, while this extreme view can no longer be held, there are many happenings to our moon that will in time relieve it from an everlasting service upon the earth. Of these happenings the author tells, and he likewise tells of the interesting discoveries that have been made of the doings of the satellites of other planets. "The Diseases of Plants," by H. Marshall Ward, the third of the number to which we referred, is not on so popular a subject as the other two, and naturally refers especially to conditions as they are in England. But, since plant-diseases are only too glad to migrate, it may well be that the instruction of this book may not be profitless here.

— Cassell & Co. will publish shortly "Star Land," a series of talks on astronomy with young people, by Robert S. Ball.

— Sir William Thomson of Glasgow University, the great European authority on electricity, has an article in the February number of *The North American Review* on "Electric Lighting and Public Safety," showing the methods adopted in Europe to guard against the dangers of electric lighting. Mr. T. A. Edison's article on this subject appeared in the November number of the *Review*, and Mr. George Westinghouse's in the December number. Among other brilliant contributions in the February number are "The Gladstone-Blaine Controversy," by Hon. R. Q. Mills; "Italy and the Pope," by Gail Hamilton; "The Doctrine of State Rights," by the late Jefferson Davis; "A New View of Shelley," by "Ouida;" "Newspapers Here and Abroad," by E. L. Godkin; "British Capital and American Industries," by Erastus Wiman; "The American Bishop of To-day," by the

Rev. J. H. Ward; "Final Words on Divorce," by Margaret Lee and the Rev. P. S. Moxom, D.D.

— The special topic in the annual report of the United States commissioner of education for the year 1887-88 is manual and industrial training. The commissioner, Mr. Dawson, is not a partisan in favor of or against the system, but presents the views and arguments of leading educators on both sides. He also gives some account of the history of manual training both in this country and in Europe, and then furnishes an outline of the courses of manual exercise that have been adopted in various places, with the comments of teachers and observers on their effect. This account of manual training occupies a hundred pages of the report, and contains a good deal that will be interesting to students of the subject. Another topic to which considerable attention is given is the training of teachers in normal schools and elsewhere, and there is also some account of the recently established teachers' reading circles. Brief abstracts of the various State reports are also given, with the usual variety of statistical matter.

— The prize offered by Mrs. John Armstrong Chanler ("Amélie Rives"), through the American Economic Association, for the best essay on the subject of child-labor, has been awarded to Mr. William F. Willoughby and Miss M. C. de Graffenreid, both of Washington, D.C. The prize was equally divided between the two contestants, their essays being of equal merit. Mr. Willoughby is a native of Alexandria, Va. He was graduated at the Washington High School, received the degree of A.B. in June, 1888, at the Johns Hopkins University, where he was awarded an "Honorary Scholarship" for three successive years, and is now a resident of Washington, D.C. Miss M. C. de Graffenreid comes of an old Southern family, she herself being a native of Georgia. She holds a position in the Department of Labor, and had a large share in the compilation of the "Fourth Annual Report of the Commissioner of Labor," on the subject of working-women, having interviewed personally eighteen thousand workmen in different parts of the country. A paper written by her on "The Needs of Self-Supporting Women" has recently been published as a supplementary note to "Johns Hopkins University Studies in Historical and Political Science."

— Among the new publications of the J. B. Lippincott Company are: "Works of William H. Prescott," a new library edition, edited by J. Foster Kirk, illustrated with portraits and maps. Through his long association with Prescott, to whom he acted as assistant in the preparation of the original edition, Mr. Kirk was enabled to incorporate in the revised work all the material collected by this celebrated historian. He has verified doubtful references, corrected typographical errors, and occasionally appended a note when statements appeared to need authentication. "Elements of Plane and Spherical Trigonometry," by Edwin S. Crawley, assistant professor of mathematics in the University of Pennsylvania. In the preface it is stated that "the aim of the author in this treatise has been to present to the student, in as concise a form as is consistent with clearness, that portion of the subject of trigonometry which is generally given in a college course. The first part of the subject is presented in much detail, each point being emphasized as far as possible by means of numerous examples and illustrations. Farther on, the student is thrown more upon his own resources, with the object of developing in him the power of making intelligent use of the materials furnished by the previous part of the course. An appendix is added in which is collected, in a manner convenient for reference, a list of such formulæ as the student will find most useful in his subsequent work in mathematics." "International Atlas of Rare Skin Diseases," edited by Malcolm Morris, London; P. G. Unna, Hamburg; H. Leloir, Lille; and L. A. Duhring, Philadelphia. This work, a periodical publication consisting of two or more parts per year, will contain the most recent and rare cases of skin-diseases that have come under the observation of the leading dermatologists of the world, thus presenting to the practitioner the most reliable information on the subject. The illustrations are chromo-lithographs. The text is rendered in English, French, and German. "The Principles

and Practice of Surgery" (second edition, thoroughly revised, with additions), a treatise on surgical diseases and injuries, by D. Hayes Agnew, professor of surgery in the medical department of the University of Pennsylvania. The order of subjects has been somewhat changed from that followed in the earlier work, and much new material has been added. Certain chapters have been transposed, others have been partly rewritten, and all have been carefully revised and illustrated. The author has embodied in the present treatise whatever by observation and experience appeared to him worthy of professional confidence, and hence it represents the most approved knowledge of the day as embraced in the science and art of surgery. His teachings as well as his practice are characterized by a humane conservatism, and show a higher regard for the welfare of the patient than for a reputation for brilliant and heroic operations. A safe practitioner, he is notably a prudent counsellor. "Foods for the Fat," a treatise on corpulency, and a dietary for its cure, by Nathaniel Edward Davies, member of the Royal College of Surgeons, England, author of "Aids to Long Life," "Medical Maxims," "Nursery Hints," etc. "Conversation on Mines between a Father and Son," to which are added questions and answers to assist candidates to obtain certificates for the management of collieries, a lecture on the atmosphere and explosive gases, table of calculations, rules of measurements, etc., by William Hopton, being a reprint from the eighth English edition. This plain and unpretentious little book has had a remarkable history. Its author determined in 1864 to issue the work chiefly as a handbook for the use of operatives and laborers in coal-mines. It filled exactly a want of the times, and from the very outset the work has had a marked success. Its language is so clear and plain that no man of ordinary native intelligence can fail to understand it. The following subjects are clearly and intelligibly explained: how mines generate gases; how the weather on the surface of the earth affects the workings of a mine; the power of explosions, and how to diminish it, etc.

— Two Americans contribute to the February *New Review*. — Mr. James and Miss Harriet W. Preston; Mr. Hamilton Aide discusses the "Deterioration of English Society;" and there is a paper on recent plays and books by Mr. L. F. Austin, Henry Irving's private secretary. Mr. Parnell is the subject of a trenchant but courteous character-study in the same number.

— "The Federal Constitution of Germany," by Edmund J. James (Philadelphia, University of Pennsylvania), a little monograph of forty-three pages, contains a translation of the text of the Federal Constitution of Germany, now for the first time made accessible to English readers. The work is of special value as showing how very different some federal governments are from others, and how accidental are some of the features of our own system which we have been accustomed to regard as essential. Alexander Hamilton argued a century ago that such a government as that of the present German Empire could not hold together, and yet there is no doubt that it is one of the strongest federal unions in existence. The constitution reveals it as a union which acts directly upon the states, and not upon the citizens of the states, like our own. It is well worth the study of American citizens. The next number in the series of publications on political economy and public law will contain the text of the Federal Constitution of Switzerland.

— John Ericsson, the great engineer, in a confidential letter written March 23, 1866, said, "The great importance of what I call the subaquatic system of naval warfare strongly presented itself to my mind in 1826; yet I have not during this long interval communicated my ideas to a single person, excepting Emperor Napoleon III. What I knew twelve years ago, he knows, with regard to the general result of my labors, but the details remain a secret with me. The 'Monitor' of 1856 was the visible part of my system, and its grand features were excluded from its published drawings and descriptions." Among Ericsson's papers were found, after his death, a series of autograph pencil-drawings, showing these concealed features of his "Monitor" system as originally conceived. They represent the ideas of subaquatic attack first presented in the "Destroyer" in 1878,

after being withheld from the public gaze by their author for half a century. These rude sketches will for the first time be made public, in facsimile, in *Scribner's* for March.

—Kirk Munroe, who has spent many winters among the Florida Seminoles, in his article for the March *Scribner*, describes the immense turban which is the universal masculine head-dress and distinguishing badge of that tribe.

—Professor William James of Harvard, in his article on hypnotism, entitled "The Hidden Self," in the March *Scribner*, says, "I know a non-hysterical woman who, in her trances, knows facts which altogether transcend her possible normal consciousness,—facts about the lives of people whom she never saw or heard of before. I am well aware of all the liabilities to which this statement exposes me, and I make it deliberately, having practically no doubt whatever of its truth. My own impression is that the trance condition is an immensely complex and fluctuating thing, into the understanding of which we have hardly begun to penetrate, and concerning which any very sweeping generalization is sure to be premature. A comparative study of trances and subconscious states is meanwhile of the most urgent importance for the comprehension of our nature."

—Horace Baker, who studied the subject carefully in Australia, will describe "The Blackfellow and his Boomerang" in the March *Scribner's*. "This curious and unique weapon," he says, "about which so much has been written and so little is really known, is a curved piece of wood, slightly convex on one side, and nearly flat on the other. It is cut from a natural bend or root of a tree, the hardest and heaviest wood being always selected, and its curve follows the grain of the wood. Thus it will vary from a slight curve to nearly a right angle, no two ever being the same shape. It is about three-eighths of an inch thick, and from two to three inches wide, tapering toward the ends, which are either round or pointed. The edge is sharpened all around, and the length varies from fifteen inches to three and a half feet."

—The March number of *The Chautauquan* presents among other subjects the following: "The Politics of Mediæval Italy," by Professor Philip Van Ness Myers; "The Archaeological Club at Rome," by James A. Harrison; "Roman Morals," by Principal James Donaldson; "Life in Mediæval Italy," by the Rev. Alfred J. Church; "Torquato Tasso," by Arlo Bates; "Traits of Human Nature," by the Rev. J. M. Buckley; "The Nationalization of Industry in Europe," by Franklin H. Giddings; "The Problems in the Physics of Photography," by Professor Edward L. Nichols; "Moral Teachings of Science," by Arabella B. Buckley; "English Politics and Society," by J. Ranken Towse; "Karl Marx," by Professor Charles J. Little; "Trusts, and How to deal with Them," by George Gunton; "Pan-American Congress," by the Hon. W. P. Frye; "The Woman Question in Germany," by Frau J. Kettler; "Common Sense as to Christian Science," by H. M. Dexter.

—Messrs. Ginn & Co. announce to be published in April, "Elements of Structural and Systematic Botany," for high schools and elementary college courses, by Douglas Houghton Campbell, Ph.D., professor of botany in the Indiana University. It is designed to serve as both a laboratory guide and an outline of the classification of the vegetable kingdom, based upon the results of the most recent and reliable authorities. To this end a number of typical plants have been carefully selected, and these studied in detail, with full directions for gathering or growing the specimens as well as for the study of their structure. This work is supplemented by a brief diagnosis of the group to which each plant belongs, with such descriptions or figures of related forms as will enable the student to recognize the common forms likely to be met with, as well as the relationships of the different groups of plants. Since the place to begin is the beginning, and the elements of botany do not consist in the "analysis" of a certain number of flowering plants, the lower plants are considered first, and at some length, as a preparation for the study of the more difficult structure of the ferns and flowering plants. This feature is especially commended to the attention of teachers as an aid in their work, as well as an incentive to the study of

these important forms, some knowledge of which is indispensable to an intelligent comprehension of any scientific classification of the plant kingdom.

—The Cassell Publishing Company, New York, announce three editions of the "Journal of Marie Bashkirtseff." The one they first issued at two dollars has been reduced to one dollar and a half; there is another in plainer binding at one dollar, and a third in paper at fifty cents. These editions are printed from the same plates; and the two former have the portrait and illustrations as in the original two-dollar edition, while the latter has the portrait only. Nothing has been "suppressed" in this translation of Mlle. Bashkirtseff's journal. Mrs. Serrano simply left out such parts as were uninteresting or trivial. The same firm also announce a new story by Judge Tourgee, under the title "Pactelus Prime." While dealing with a new phase of the race problem, the author slashes right and left at the pet follies of the time, and touches a good many people's self-complacency, who perhaps have little thought of being hit.

—P. Blakiston, Son, & Co., Philadelphia, will publish next week a new German-English medical dictionary, by Frederick Treeves, F.R.C.S., and Mr. Hugo Lang; "A Manual of the Practice of Medicine," by Frederick Taylor, M.D.; and a text-book on obstetrics, by Dr. F. Winckel (Munich), translated by Professor Edgar F. Smith of the University of New York.

—Last week's issue of *Garden and Forest* contains an interesting view of the entrance to Père-la-Chaise, the famous Parisian cemetery, and an illustration of a remarkable specimen of the beautiful blue orchid, *Vanda cœrulea*; Mr. William Watson of the Royal Gardens at Kew writes of cape heaths; and the duty of Congress to our public forests is discussed editorially. Among the contributors to this number are Professor Budd of Iowa, Herr Max Leichtlin, Charles A. Dana, and Mrs. Schuyler Van Rensselaer.

—The following new publications are announced by the J. B. Lippincott Co.: "A Text-Book of Assaying," for the use of students, mine managers, assayers, etc., by J. J. Beringer, lecturer to the Mining Association of, and public analyst for, the county of Cornwall; and S. C. Beringer,—a work that has been prepared to meet the existing want of a practical "handy-book" for the assayer. Aside from a description of those substances which have a commercial value, the work contains short accounts of the rarer elements, since they are frequently met with, and occasionally affect the accuracy of an assay. Under the more important methods, the results of a series of experiments showing the effect of varying conditions on the accuracy of an assay are given. This record will be of great value to students who, learning any particular process, cannot do better than repeat such a series of experiments. "Manual of Mythology in Relation to Greek Art," by Maxime Collignon, translated and enlarged by Jane E. Harrison, author of "Manual of Ancient Sculpture." The subject of this work is not mythology in general, but strictly mythology as seen in art. Literature is cited, but only in so far as it throws light upon the conceptions of art. All questions dealing with the origins of myths and their literary variations are of necessity set aside. A brief summary is first given of the general principles that govern the formation of types in art; and the development of the type of each god or goddess, genius or hero, is historically considered. The book is intended, in fact, to supplement, not to supersede, existing handbooks. "Manual of Ancient Sculpture," by Pierre Paris, formerly member of the Ecole Française at Athens; edited and augmented by Jane E. Harrison, author of "Introductory Studies in Greek Art," etc. "Crime: Its Nature, Causes, Treatment, and Prevention," by Sanford M. Green, author of "Green's Practice," etc. Of books in press, the firm announces "Stanley's Emin Pasha Expedition," by A. J. Wauters, with maps, thirty-four portraits, and illustrations; "Medical Diagnosis," a guide to the knowledge and discrimination of disease, by J. M. Da Costa, M.D.; "A Text-Book of Clinical Diagnosis: The Chemical, Microscopical, and Bacteriological Evidence of Disease," translated from the second edition, by James Cagney, with additions by William Stirling, professor of physiology, Owens College, Manchester; "Lippin-

cott's New Series of Readers," by Eben H. Davis, superintendent of schools, Chelsea, Mass. (complete in four books; the third and fourth readers in press); "How to Remember History," a method of memorizing dates, with a summary of the most important events of the sixteenth, seventeenth, eighteenth, and nineteenth centuries, for the use of schools and private students, by Virginia Conser Shaffer; "A System of Oral Surgery" (fifth edition, thoroughly revised, with important additions), being a treatise on the diseases and surgery of the mouth, jaws, face, teeth, and associate parts, by James E. Garretson, surgeon in charge of the Philadelphia Hospital of Oral Surgery, dean of the Philadelphia Dental College, etc.; "Chambers's Encyclopædia," Vol. V. (new edition), edited and published under the auspices of W. & R. Chambers, Edinburgh, and J. B. Lippincott Company, Philadelphia, to be completed in ten volumes; "Recollections," by George W. Childs; and "Historic Note-Book," by the Rev. E. Cobham Brewer, Trinity College, Cambridge, author of "The Reader's Hand-Book," "Dictionary of Phrase and Fable," etc.

LETTERS TO THE EDITOR.

Mock Sun.

THE train leaving Albany for Boston, in surmounting the hills east of the Hudson River, affords the traveller very beautiful views of the wide valley, the river, and a picturesque sky-

line formed by the bold and broken Helderbergs. On the evening of the 9th this view was enhanced in beauty by a superb sunset, having seemingly the double glory of two suns twenty degrees apart. It was not easy to determine the actual sun, so brilliant were both reality and counterfeit; but the mock sun, like many pretenders, overdid the thing a little, and assumed very gorgeous rainbow effects, that are not seen very near the royal original. It was north of the actual sunset.

The pretender was not, however, the often seen "sun-dog," which is ordinarily a scrap of rainbow color, but it had a luminous centre of golden refulgence, that was worthy of the orb of day; and, when seen by shutting off the sun with a shade, it made a centre of a brilliant sunset, really holding a court of its own.

This most attractive phenomenon, with varying changes, all wonderful, lasted for nearly half an hour, affording, in connection with the remarkable views, a very unusual union of terrestrial and celestial beauty. The change of our point of view was five or six miles as the train sped on; but the thin clouds upon which the colors were so lavishly embroidered were very far away, not showing perceptible change in position relative to the sun with that movement of the observer.

The same phenomena were simultaneously observed at Cazenovia, one hundred and ten miles due west, but there the sun's rival was seen south of the great luminary.

The next day was clear and fine at Cazenovia, but snowing at Boston, indicating that the frost crystals that masqueraded

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as celestial bodies were moving as storm-centres drift, eastward.

Would it not be of interest to learn from correspondents how far the gay deceiver was seen? It was so exceptionally striking, that no person favorably situated could have failed to observe it, and no one could but be impressed by the beauty of the unusual event.

L. W. LEDYARD.

Cazenovia, N.Y., Feb. 18.

The Fiske Range-Finder.

WITH reference to the note of Lieut. Casey in your issue of Jan. 31, 1890, calling attention to an apparent hiatus in the theory of my range-finder, permit me to say that Lieut. Casey is entirely correct in all his statements and deductions, but that the instrument does in reality make an automatic correction which has not yet been publicly described. There are a number of ways of accomplishing it; but it does not seem advisable to describe any of them yet, in view of patent applications now pending.

BRADLEY A. FISKE, U.S.N.

Norfolk, Va., Feb. 12.

Answers.

49. INFLUENZA.—In reply to the query in *Science* of Jan. 17, "Has epidemic influenza been known to cross the equatorial line?" I beg to append the following: The epidemic of 1836-37, which originated probably in Russia, "also spread to the southern hemisphere, and prevailed at Sydney and the Cape of Good Hope at the same time that it visited the north of Europe" (*Cyclopædia of Medicine*, VON ZIEMSEN, ii. p. 522).

HARVEY B. BASHORE.

West Fairview, Penn., Feb. 17.

INDUSTRIAL NOTES.

Improvements in Electric Motors.

IN *Science* of Dec. 13, the Crocker-Wheeler electric motor, as applied to pumps and fans, was illustrated and described. The accompanying engravings show the improved motor as now manufactured by the Crocker-Wheeler Company, and also an improved starting-switch and device for adjusting the speed and power.

The improved motors contain all the features which, during several years' experience in the manufacture and operation of a large number of successful motors, have been found to increase their strength, economical use of current, general appearance, and their convenience for starting, stopping, and regulating. The construction has been improved to permit the use of wire on the armature two sizes larger than has been possible before, therefore making the winding much less liable to breakage, and enabling it to carry more current without heating. The $\frac{1}{2}$ horse-power motor is made to run at a practically steady speed, even with the most sudden and heavy changes of load. The base is made extra heavy, with the centre of gravity low, to add to the steadiness and solidity of the machine. The bearings are made of the best babbitt metal, the same as on large steam-engines and other first-class machinery, this being a new feature in small motors.

The efficiency of these machines, or the amount of power that they will furnish from the consumption of a given amount of electricity, has been materially increased. The direction of rotation is made reversible by simply changing the brush-holders, and considerable advance is made in the finish of the machine, the best workmanship being bestowed upon every part.

With the adjusting-switch in the position shown in Fig. 2, these motors run at full speed (1,900 revolutions per minute), and in the position shown in Fig. 3 they run at about half speed. The windings are so proportioned that in either case the proper current flows through, and runs the motors at the respective speeds with high efficiency.

The new "K" winding on these machines takes the place of the lamp frequently used on the top of other motors to vary the speed. It is a radical improvement in this respect, saving the current usually wasted on the lamp, and giving a means of instantly changing the motor's speed by turning the knob

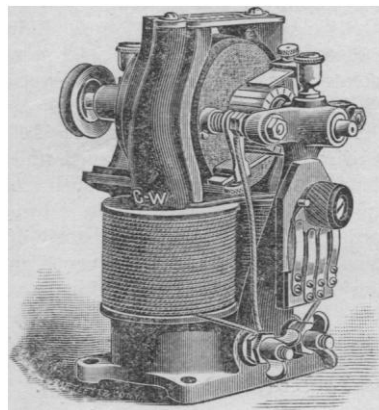
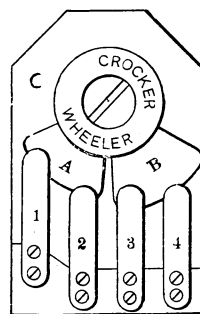


FIG. 1.

without the use of resistance-boxes or the trouble of unscrewing and removing a lamp. The starting-switch is shown in Fig. 4.

The arrangement is adapted to running fans, pumps, and all kinds of machinery that are not subject to extreme variations, and is superior for these purposes on account of the facilities it



FIGS. 2 AND 3.

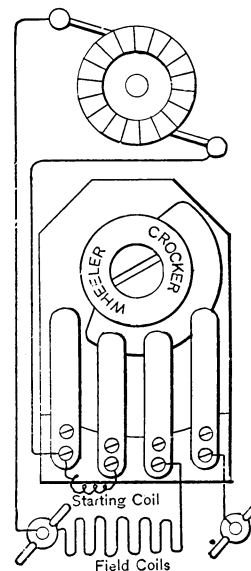


FIG. 4.

offers of changing the speed. For work which is variable and sometimes thrown off entirely, as in the case of buff-wheels, lathes, etc., the constant speed motors are preferable, because they maintain steady speed at all times.

The Springfield Industrial Drawing-Kit and Drawing-Model Support.

EVERY draughtsman finds a drawing-board, a T-square, and one or more triangles as essential to his work as are the scale of inches and the compasses, and every pupil in mechanical drawing requires a similar outfit. The Springfield industrial drawing kit, shown in the illustrations, is intended for use in grammar and high schools, the family, the office, and the shop.

The set (Fig. 1) consists of a board about ten by twelve inches,

to which a pad of drawing-paper is fastened, and a wooden T-square and triangles of suitable size. The draughtsman or architect fastens the piece of paper on which he is working to his drawing-board by means of thumb-tacks; but this method has proved both expensive and annoying in the primary grades of schools, so the scheme of the pad has been devised. This pad is slightly glued to the board at each corner, and the sheets com-

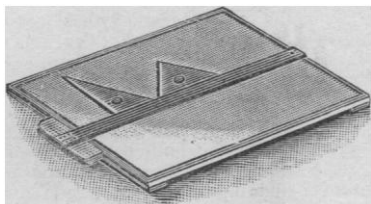


FIG. 1.

posing it are torn off one by one as fast as they are used. The pads are sold separately from the boards, and can be renewed as often as circumstances require. The T-square is a substantial instrument, having a blade fourteen inches long. The head is adapted for use with the pad, as well as the single sheet, being unusually thick, so as to allow it to have a hold on the board when the pad is of full thickness. The two triangles, commonly

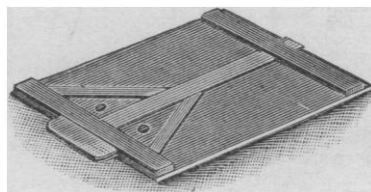


FIG. 2.

called the 45° and 60° triangles, include the standard angles, 90°, 45°, 60°, and 30°.

As a convenience in keeping the several pieces of the set together, the back of the board is provided with grooved cleats, and the cross-cleats at the two ends of the board are slotted to receive the tongue of the T-square, as shown in Fig. 2.

A few sample boards were placed in the schools of Springfield, Mass., by way of experiment, three years ago, and since that time their use has spread to such cities as Providence, R.I.; Hartford,

Conn.; Harrisburg, Penn.; Cambridge, Chelsea, Quincy, Brookline, Mass.; Pawtucket, R.I.; and various other places; while the demand is constantly increasing.

A kit of larger size, called the No. 2 kit, double the size of the other, and without pads, is also made, intended for the use of advanced pupils and draughtsmen.

In connection with these instruments, the manufacturers, the Milton Bradley Company of Springfield, Mass., have just put on the market a support for models used in drawing (Fig. 3). It is so made that it may be attached to the ordinary school-desk, and removed at pleasure. Now that form-study has become a legitimate branch of every well-devised school course, there is a necessity that the pupils' desks shall be properly equipped for

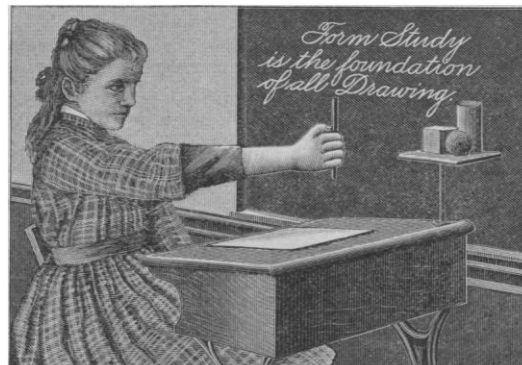


FIG. 3.

the pursuit of this study, which is equally urgent with the demand that they shall be supplied with conveniences for writing. The support for drawing-models shown in the illustration can be readily adjusted, and easily removed from the desk at pleasure. The wooden table on which the models rest, within easy reach of the pupil sitting at the desk, is supported by a wooden rod, which passes through a hole in the top of the desk, and also through the shelf underneath. A metallic cam attached to the top of the desk, at the corner opposite the ink-well, holds the rod and the table at any desired height. The table can quickly be removed from the rod, and may be placed in the desk, or collected with those from the other desks, and kept in a suitable cupboard when not in use. The rod is then dropped to the level of the desk-top, so that nothing is seen above the desk.

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CALENDAR OF SOCIETIES.

Philosophical Society, Washington.

Feb. 15.—Gardiner G. Hubbard, An Account of Stanley's Discoveries in Africa; C. D. Walcott, A Study in Structural Geology.

Appalachian Mountain Club, Boston.

Feb. 14.—F. H. Chapin, Climbs in the Cañon of the Rio Mancos, Col.: A Visit to the Homes of the Cliff-Dwellers.

Boston Society of Natural History.

Feb. 19.—Samuel Garman, Some Recent Discoveries in Caves; W. O. Crosby, A Large Granite Boulder in Madison, N.H., and The Occurrence of Decomposed Granite in Blandford, Mass.

Publications received at Editor's Office,
Jan. 27-Feb. 15.

- ASTRONOMICAL Observatory of Harvard College, Annals of the. Vol. XXI. Part I. Observations of the New England Meteorological Society in the Year 1888. Cambridge, W. H. Wheeler, pr. 105 p. 49.
- Same. Vol. XXII. Meteorological Observations made on the Summit of Pike's Peak, Colorado. . . . January, 1874, to June, 1888. Cambridge, John Wilson & Son. 475 p. 49.
- BALL, R. S. Time and Tide, A Romance of the Moon. London, Society for promoting Christian Knowledge; New York, E. & J. B. Young & Co. 192 p. 169. \$1.
- BRAY, H. T. The Evolution of a Life; or, From the Bondage of Superstition to the Freedom of Reason. Chicago, Holt Publ. Co. 436 p. 129. \$2.
- CLUTTERBUCK, W. J. The Skipper in Arctic Seas. London and New York, Longmans, Green, & Co. 271 p. 129. \$2.25.
- CRAWLEY, E. S. Elements of Plane and Spherical Trigonometry. Philadelphia, Lippincott. 159 p. 129. \$1.
- DAVIS, E. H. The Third Reading-Book. Philadelphia, Lippincott. 336 p. 129. 56 cents.
- GOODWIN, W. W. Syntax of the Moods and Tenses of the Greek Verb. Boston, Ginn. 464 p. 89. \$2.15.
- HALL, I. F. The Riverside Manual for Teachers. (Riverside Literature Series, extra No.) Boston and New York, Houghton, Mifflin, & Co. 169. 15 cents.
- NORTON, C. L. A Handbook of Florida. Part I. The Atlantic Coast. New York, Longmans, Green, & Co. 240 p. 169. 50 cents.
- PHYSICAL TRAINING Conference, a Full Report of the Papers and Discussions of the, held in Boston in November, 1889. Ed. by Isabel C. Barrows. Boston, G. H. Ellis. 135 p. 89.
- SALOMONS, D. Electric Light Installations and the Management of Accumulators. New ed. London, Whittaker & Co.; New York, Van Nostrand. 394 p. 129. \$1.50.
- SCHENCK, F. S. The Ten Commandments in the Nineteenth Century. New York and London, Funk & Wagnalls. 139 p. 129.
- SICKELS, I. Exercises in Wood-Working, with a Short Treatise on Wood. New York, Appleton. 158 p. 89.
- THURSTON, R. H. A Handbook of Engine and Boiler Trials, and of the Indicator and Prony Brake. New York, Wiley. 514 p. 89. \$5.
- TIDY, C. M. The Story of a Tinder-Box. London, Society for promoting Christian Knowledge; New York, E. & J. B. Young & Co. 105 p. 169. 80 cents.

Exchanges.

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I have a number of duplicates of microscopic slides, mostly botanical, which I would like to exchange for others not now in my collection. Send list of what you have to exchange and get my list. S. R. Thompson, New Wilmington, Pa.

Correspondence and exchanges solicited with persons interested in the study of American and Mexican antiquities. L. W. Gunckel, 36 Elm St., New Haven, Conn.

I wish to exchange or purchase well-fixed or hardened vertebrate embryos for sectioning. Desire specially reptilian embryos, but will be glad to secure any material that I do not possess. Thomas G. Lee, M.D., Histological Laboratory, Yale University, New Haven, Conn.

Wanted.—Books and journals, American or foreign, relating to Photography, exchange or purchase. C. W. Canfield, 135 Broadway, New York.

Wanted.—Marine univalves of the west coast, from U. S. line southward, and from Pacific Islands, offered; exchange from a general collection. — F. C. Browne, Framingham, Mass., Box 30.

D. E. Willard, Curator of the Museum, Albion Academy, Albion, Wis., will answer all his correspondence as soon as possible. Sickness and death in the family, with many other matters, have prevented his answering as promptly as he should have done.

I will give 100 good arrow heads for a fine pair of wild cattle horns at least two feet long. If you have shorter or other horns write me, and also how many arrow heads you want for them. I will also exchange shells, minerals and arrows. W. F. Lerch, 308 East 4th St., Davenport, Iowa.

A few duplicates of *Murex radix*, *M. ramosus*, *M. brandaris*, *Cassia rufa*, *Harpa ventricosa*, *Oliva triatula*, *O. reticularis*, *Chlorostoma funebre*, *Cypria caput serpentis*, *C. lynx*, *Lottia gigantea*, *Acmodonta patina*, *Chama spinosa*, and some thirty other species, for exchange for shells not in my collection. List on application. — Curator Museum, Polytechnic Society, Louisville, Ky.

Photographs and Stereoscopic views of Aborigines of any country, and fine lapidaries, etc., wanted in exchange for minerals and fossils. — L. L. Lewis, Copenhagen, New York.

Droysen's *Allgemeiner Historischer Hand-atlas* (Leipzig, 1886), for scientific books — those published in the *International Scientific Series* preferred. — James H. Stoller, Schenectady, N.Y.

Astronomical works and reports wanted in exchange or to buy. Reports of observations on the planet Neptune and its satellite specially desired. — Edmund J. Sheridan, B.A., 295 Adelphi St., Brooklyn, N.Y.

I would like to correspond with any person having Tryon's "Structural and Systematic Conchology" to dispose of. I wish also to obtain State or U.S. Reports on Geology, Conchology, and Archaeology. I will exchange classified specimens or pay cash. Also wanted a copy of MacFarlane's "Geologists' Traveling Hand-Book and Geological Railway Guide." — D. E. Willard, Curator of Museum, Albion Academy, Albion, Wis.

Morris's "British Butterflies," Morris's "Nests and Eggs of British Birds," Bree's "Birds of Europe" (all colored plates), and other natural history, in exchange for Shakesperiana; either books, pamphlets, engravings, or cuttings. — J. D. Barnett, Box 735, Stratford, Canada.

I have *Anodonta opalina* (Weatherly), and many other species of shells from the noted Koshkonong Lake and vicinity, also from Western New York, and fossils from the "Moccasin" of New York, which I would be glad to exchange for specimens of scientific value of any kind. I would also like to correspond with persons interested in the collection, sale, or exchange of Indian relics. — D. E. Willard, Albion Academy, Albion, Wis.

Shells and curiosities for marine shells, curiosities or minerals address W. F. Lerch, No. 308 East Fourth St., Davenport, Iowa.

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As heretofore, PROF. GOLDWIN SMITH will, from time to time, contribute articles. London, Paris, Washington and Montreal letters from accomplished correspondents will appear at regular intervals. Special Ottawa Letters will appear during the sessions of Parliament.

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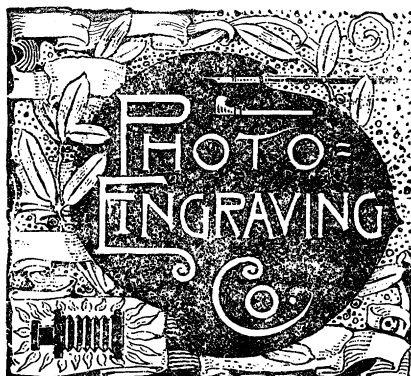
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